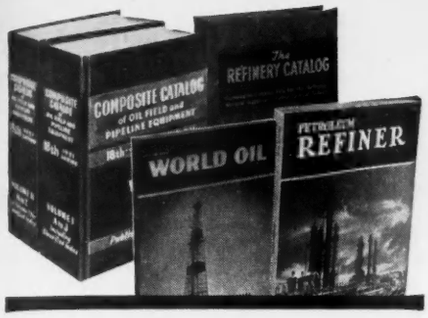

Specialized Oil Publications of
THE GULF PUBLISHING COMPANY
3301 Buffalo Drive, Houston 6, Texas
Box 2608, Houston (1), Texas
WORLD OIL and The COMPOSITE CATALOG
for the drilling-producing-pipe line industry
PETROLEUM REFINER and The REFINERY CATALOG
for the refining-natural gasoline industry

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Single copies 50 cents (except special issues). Subscription price: domestic and foreign, $2 a year; 2 years, $3; 3 years, $4. WORLD OIL, published every month except semi-monthly in February and July. Entered as *The Oil Weekly* as second class mail matter December 23, 1916, at the post office at Houston, Texas, under the act of March 3, 1879. Advertising rates on application. Copyright, 1951, by The Gulf Publishing Company.

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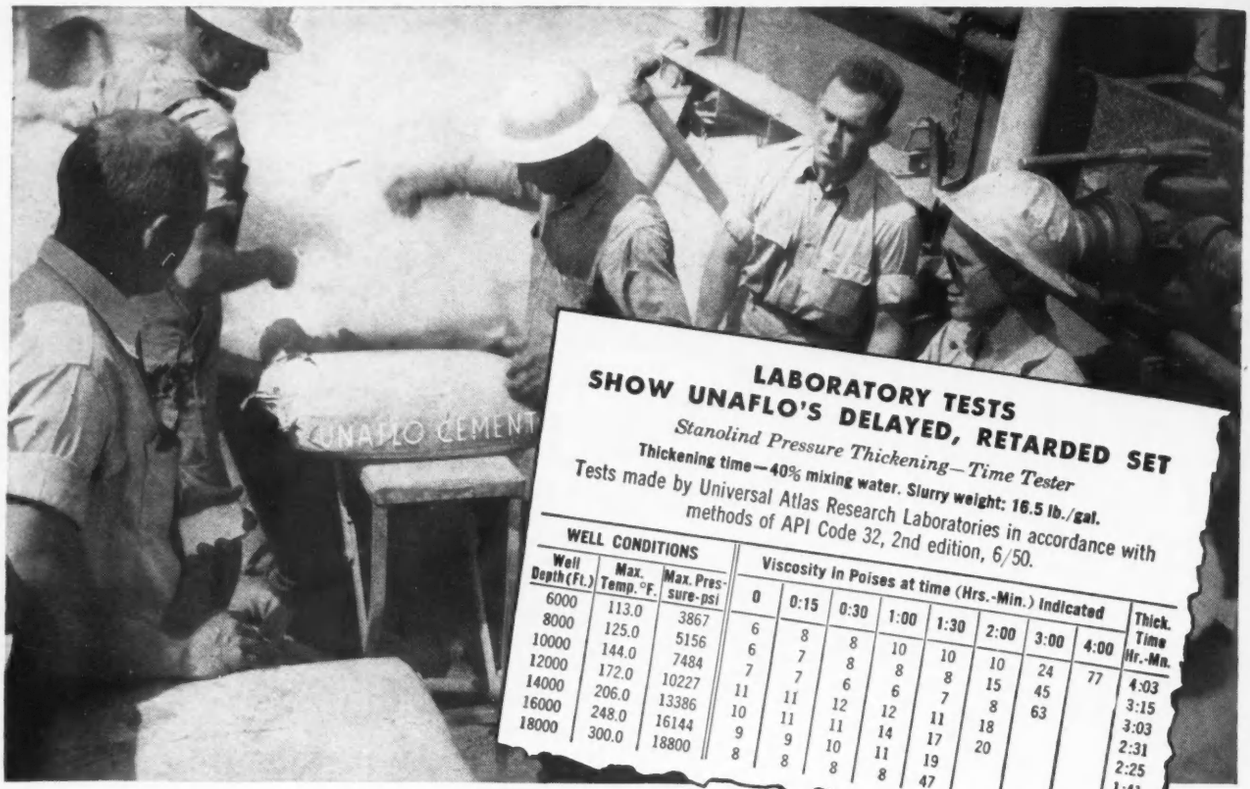
L. J. LOGAN, SECTION EDITOR

WORLD OIL



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Well Depth (Ft.)	Max. Temp. °F.	Max. Pressure-psi	0	0:15	0:30	1:00	1:30	2:00	3:00	4:00	Thick. Time Hr.-Mn.
6000	113.0	3867	6	8	8	10	10	10	24	77	4:03
8000	125.0	5156	6	7	8	8	8	15	45		3:15
10000	144.0	7484	7	7	6	6	7	8	63		3:03
12000	172.0	10227	11	11	12	12	11	18			2:31
14000	206.0	13386	10	11	11	14	17	20			2:25
16000	248.0	16144	9	9	10	11	19				1:41
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Unaflo *Retarded* Oil-Well Cement
Resistant to Sulfate Waters
Atlas Portland Cement—Type I

Atlas Portland Cement—Type II
Resistant to Sulfate Waters
Atlas High-Early Cement—Type III

WO-U-122

"THE THEATRE GUILD ON THE AIR"—*Sponsored by U. S. Steel Subsidiaries—Sunday Evenings—NBC Network*

Looking Ahead

PERMIAN BASIN of West Texas and southeast New Mexico will continue dominant in U. S. development, as revealed in various articles of this issue, devoted especially to that region. Producing 1¼ million barrels daily, the most it ever did, the district accounts for one fifth of total U.S. production and yields more than any state except Texas. It produces more crude than any nation except the U.S. and Venezuela.

OIL COMPANIES should show substantially higher earnings in 1951 than in 1950, in contrast with a possible decrease of 10 or 15 percent for business in general. Especially aiding oil earnings is record volume of business, with oil demand for 1951 due to be about 10 percent above 1950.

FOR THE OIL INDUSTRY there may be significance in current business news in general, which reveals actual or prospective over supplies, slowing of demand, and sales, and weakening of prices. Markets for petroleum products could be weakened by industrial slowdowns, sluggish wholesale and retail business volumes, farm surpluses, and lower prices for cotton, wheat, lumber, and other commodities.

PETROLEUM DEMAND henceforth may show less impressive growth because of slowdown in sales of farm equipment. Oil use was boosted in past ten years by increases in farm tractors to 4 million from less than 2 million; in mechanical corn pickers to 400,000 from 120,000; in grain combines to 700,000 from about 225,000.

SLOWDOWN OF STEEL PRODUCTION is threatened by deficiency of scrap iron. Oil operations afford important supplies of scrap, and oil companies are urged to furnish all they can, being reminded also that steel for oil requires scrap for steel.

MIDDLE EAST will be unsettled for extended period by unrest of Arab rulers in regard to royalty payments on production of their oil. Developments in Iran will influence demands for higher royalties in Iraq, Kuwait, Qatar, and Bahrein Island. Under new agreement, payments to Saudi Arabia's king already are up to exceptionally high level.

HOLDING SLIGHTLY more than half the world's crude reserves, while accounting for only 17 percent of world production, the Middle East will claim an increasingly greater share in world markets. Reserves are equivalent to 75 years' supply at 1950 production rate, compared with only around 15 years' supply held in either Fart East, Europe, South America, or North America.

COAL IS COMPETING with oil and gas with noteworthy results, utilizing new methods and equipment that cut costs and promise to hold down coal prices. This was emphasized recently when Pittsburgh Consolidation Coal Company put in to operation at Cadiz, Ohio, the industry's largest coal cleaning plant. This mechanical cleaning, to remove foreign materials and separate coal by sizes, is only one phase of current coal industry mechanization.

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Editor's Page

UNRESTRICTED OPPORTUNITY THE KEY

NATURAL RESOURCES are said to constitute a nation's strength. However, natural resources are of no value until developed so they become useful. Therefore, the strength of any nation is determined more by how well its natural resources are developed than on the quantity of natural resources.

The U.S.S.R. comprises one side of this picture. Regarded by geologists as holding a large portion of the world's favorable oil area, it produces only 800,000 barrels per day in contrast with United States production of more than 6 million barrels daily. Despite being blessed with abundant petroleum resources, improper development causes Russia still to need additional oil; i.e., one of the first actions upon gaining control of Rumania was to arrange means of shipping Rumanian oil to Russia.

Resourceful people can even do much to overcome the lack of natural resources. Germany has been able in the past 35 years twice to wage a terrific large-scale war against the combined strength of many nations, although lacking sufficient oil resources for the mechanized units of modern warfare. Through the resourcefulness of its people, Germany was able to develop a vast synthetic fuels industry that carried her a long way.

The U. S. is the outstanding example of what the unretarded development of natural resources can mean. For many, many years the U. S. has produced from half to two-thirds of the world's oil, although less than 15 percent of the globe's petroleum resources are believed to lie within the boundaries of this country. An abundant petroleum supply has been enjoyed by the U. S. only because of greater and better development of its oil resources.

• • •

THE PERMIAN BASIN AREA of West Texas and Southeast New Mexico, to which this issue of WORLD OIL is devoted, is symbolic of what can be achieved by competitive businesses operating under a system which rewards rather than stifles individual initiative and ingenuity.

Thirty years ago the Permian Basin had no oil production. Today, the area is producing 1¼ million barrels daily, one-fifth of the incredible output of the U. S., half again as much as all of Russia produces, and more than any nation except the U. S. and Venezuela.

By no means other than the American private enterprise system could so much oil have been developed in so short a time. The reason: thousands of individuals and privately-owned companies competing vigorously under a free enterprise system have searched diligently and effectively all over the area because they have not been retarded by restrictions—such as state ownership, state monopoly or even large landed gentry—which limit the right to drill.

The Permian area has been the scene of one important oil development after another. As soon as one begins to taper off, another invariably springs up to take its place. During 1948 and 1949, attention was focused on the search for production in the Pennsylvania reef formation. Today, the search for production in the Spraberry formation overshadows all previous plays, including the reef activity of two years ago. Although Spraberry production thus far extends over an area only 130 miles long and 50 miles wide, more than 150 wells currently are drilling for the horizon.

• • •

IF OTHER NATIONS WOULD PERMIT the search for oil on the same scale as in the U. S., many also would have petroleum in abundance. However, this will never occur unless the door to opportunity is open to all, where everyone willing to take financial risks can hope for adequate rewards. People are moved to real creative and productive effort only by the hope of individual gain.

Warren L. Baker

the right ~~card~~ tool in the hole

There is no other tool you can use so effectively, so safely and so economically as the Baker Model "K" Cement Retainer (Product No. 400) for so many of the vital operations in your wells. It has truly proved a "lifesaver" for countless thousands of wells in such difficult work as squeeze cementing, testing, acidizing, or as a bridge plug—and it has even been used successfully to pick up and cement in position a lower section of a string of casing which had broken or backed-off.

SETS EASILY—HOLDS POSITIVELY The Baker Cement Retainer can be set accurately, readily and securely at any desired point. It maintains a leak-proof pack-off under any pressure which can safely be imposed on the casing, and permits placing cement, acid, or other fluids at any predetermined point behind the casing or liner; around the shoe joint; or into the open hole below.

READILY DRILLED UP Then, after the work has been successfully completed, the Baker Cement Retainer is quickly and easily drilled up, because the entire tool has been designed with a minimum cross-sectional area, so as to break up readily under the drilling bit—and construction of either Cast Iron or Magnesium Alloy further insures "drillability." Even the slips are segmented to break up readily into small, harmless fragments.

USED ALSO AS BRIDGE PLUG The Baker Cement Retainer can be converted into a casing bridge plug for setting on tubing, or better yet, on an electrical conductor cable. You can save wear and tear on precious tubing by calling your choice of the leading wire line service organizations—or ask any Baker representative or office for details.

BAKER OIL TOOLS, INC. HOUSTON • LOS ANGELES • NEW YORK

DON'T GAMBLE WITH THE MOST IMPORTANT WORK IN YOUR WELL—*USE THE "OLD RELIABLE"*

BAKER Model "K" CEMENT RETAINER

The Changing Panorama

U. S. Tidelands Grab Only the Beginning

A RECENT development has proved that there are good grounds for expecting the federal government to proceed beyond seizure of the tidelands, if it succeeds in that move, by similarly asserting claims to rivers, lakes, and other state properties and even to private properties, in the name of the national welfare.

The U. S. government has filed a suit seeking to establish title to the waters of the Santa Margarita River in California. It asserts that the water is needed for Camp Pendleton, and claims for the U. S. government "paramount" and "sovereign" rights to the water. These are the same "rights" claimed by the federal government and upheld by the U. S. Supreme Court in the seizure of the offshore lands traditionally owned by California, Texas, and Louisiana.

The Truman administration, having pressed the federal claim against the wishes of Congress, as expressed in a quitclaim bill that was vetoed, has denied repeatedly that it intends to claim inland waters. It has made this promise to disarm inland states, while at the same time baiting them with visions of participation in revenues from continental shelf oil.

Supporters of the claims of California, Texas, and Louisiana have warned that if the federal government successfully consummated the tidelands seizures, no state or private property then would be safe from similar confiscation. Under this convenient doctrine of "paramount rights" of the U. S. government, it was warned, a socialistic-minded administration could easily nationalize all property and socialize the country. The bureaucrats could declare iron ore deposits of Minnesota and coal mines of Illinois essential to national defense and assert "paramount" rights over them.

They could similarly claim need for federal ownership of "strategic" minerals and mines in each of the Rocky Mountain states; harbor facilities along the coast of each state on the Atlantic Seaboard, the Gulf Coast, the Pacific Coast, and the Great Lakes. The federal government could claim the beds and valleys of the rivers that make up the great inland waterway system between the Great Lakes and the Gulf of Mexico, bordering or flowing through a dozen states of the Middle West and the South. It could take over the fishing industries of New England and the Pacific Northwest, and all railroads and private electric power utilities.

The tidelands cases and now the Santa Margarita River case sound clear warning that under the philosophy of the present executive and judicial branches of the government, no property is safe from seizure without compensation. (In the past, the government has had the power to condemn private property for public use, but has had to show specific and present need for it and has had to make fair compensation to the owners.)

All properties, industries, and resources owned by individuals and states are essential to the national welfare and defense. If the government is to assert "sovereignty" and "paramount rights" over all things that contribute to national defense, it may take over not only the oil of the tidelands but also mines, steel mills, automobile factories, railroads, waterways, all utilities, highways, farms, ranches, and homes. The doctrine can be extended, step by step, until all property, resources, utilities, banking, and industry are nationalized and state socialism is made complete.

The California river case as well as the tidelands cases show the necessity of action by Congress specifically denying federal claim to the tidelands and inland waterways as well as other state and private properties. Fortunately, the House of Representatives July 30 approved by a 71 percent majority vote (265 to 109) and sent to the Senate a federal quitclaim bill that would give the states clear title to submerged lands extending out three miles from their coasts (10½ miles in the case of Texas, because of its annexation treaty). However, the measure still faces action by the Senate and veto if passed there, after which it would have to be passed by two-thirds majorities in both houses in order to become law, which may prove impossible. The U. S. has been heading toward the left for 20 years, has immense momentum in that direction, and cannot easily turn back toward the right.

Industry Helps Solve Shortage of Sulfur

OIL COMPANIES will themselves solve to some extent the present serious sulfur shortage by installing plants to remove sulfur from natural gas at refineries and in fields, at the same time improving and increasing value of the gas. Shamrock Oil & Gas Company already is producing sulfur from natural gas in the Texas Panhandle. Phillips Petroleum Company's chemical division is building a plant in the Goldsmith field, Ector County, West Texas, to take sulfur from gas for manufacture of ammonium sulfate fertilizer.

Sunray Sets Example By Collecting Scrap

A PROBLEM second only to the steel shortage is the scrap scarcity. Scrap is vital to make steel and the mills are not getting enough.

In this respect the oil industry can help the mills and itself at the same time, since oil fields are prolific sources of scrap material.

Sunray Oil Corporation, Tulsa, recently conducted a company-wide scrap drive throughout its oil producing leases in ten states, at three refineries and half a dozen field gasoline plants, and collected and returned to the scrap salvage market more than 820 tons (approximately 1,640,000 pounds) of iron, steel and other metal scrap.

Sunray's campaign was inaugurated in cooperation with the National Production Authority's request for users of steel products to help themselves by helping the steel industry secure more scrap. All segments of the petroleum industry have been asked to cooperate in a nationwide campaign.

Sunray's scrap was gathered and turned back into the steel market through sale to local district scrap salvage dealers. The Mid-Continent division contributed 160 tons. The company's Allen and Sunray (Duncan) Oklahoma refineries disposed of 108 tons. The Mid-Continent gas-gasoline department collected and disposed of 31 tons, and the West Coast division Refining and Gasoline departments have disposed of 521 tons of scrap.

Report from the Observatory

SUPPLY CONTINUES ABOVE DEMAND

By RAY L. DUDLEY, Publisher, and WARREN L. BAKER, Editor

THE ECONOMIC OUTLOOK for the U. S. oil industry improved slightly the past month, but not sufficiently to remove an excessive inventory threat. Improvement occurred because stepped-up drafts reduced gasoline nearer to 1950 levels than since early April. However, record level operations maintained U. S. supply as a whole above demand. Inventories of crude, distillate and residual fuel oil continued to widen their margins over 1950 volumes as they accumulated more rapidly than year ago rates. Distillate inventories in particular were attaining volumes that could become troublesome this fall.

The 75,000-barrel per day hike in Texas September production allowable will boost operations even higher next month, so further buildup of stocks is indicated although additional export shipments because of the Iranian shutdown will tend to hold down the rate of gain.

• • •

WHAT HAPPENS IN IRAN will have considerable bearing on the future, and no one can tell at this stage how long Iranian production will be shut down. Settlement of the Iranian problem would confront the industry with the immediate necessity of curtailing production and refinery operations to prevent runaway accumulation of stocks. Continued shutdown in Iran would help relieve the U. S. inventory situation, although there has been an inclination to overrate the effect of Iran's shutdown on U. S. operations.

Principal effect of the loss of Iranian production will be felt in the residual fuel oil market. Bulk of Iran's oil consisted of 250,000 barrels of residual fuel oil daily, and the market for residual will be very tight since it also is in low supply in the U. S. Crude oil represented only 150,000 barrels of the 650,000 barrels of production marketed daily from Iran, and this comparatively small amount can be made up from other Middle East countries and Venezuela. Gasoline comprised only 100,000 barrels daily of Iran's output, and this small quantity can be replaced rather easily.

Although foreign buyers have stepped up purchases in the U. S., loss of more than 38 million barrels of crude and products since Iranian exports ended two months ago has had little effect on U. S. operations. The volume of extra purchases in August averaged about 200,000 barrels daily, twice the average U. S. exports of all refined products in the first six months of 1951. By mid-September these temporary purchases are expected to exceed 300,000 barrels per day. While these additional export shipments will provide some relief to rising U. S. product inventories, the latter rate of purchases amounts to only a small volume in comparison with U. S. demand.

• • •

MATERIAL IMPROVEMENT in the gasoline inventory position was the highlight of the past month. Stocks totaled 116⅔ million barrels on August 18, which was only 8½ million barrels greater than a year previous although they had been 12½ million barrels larger than in 1950 only a month earlier.

If gasoline inventories can be reduced an average of only 100,000 barrels a day in September, stocks by October 1 would approximate 112 million barrels, or not too much above the desired end-of-season level of 110 million barrels. This seemed impossible a month ago.

However, uneven distribution of the increase in gasoline stocks may cause some difficulty. Too much of the gain has occurred in the Mid-Continent marketing area (Oklahoma, Kansas, Missouri, Indiana, Illinois, Kentucky) where stocks were 6 million barrels above a year ago. Increases in other areas have not been out of line, and California had a million barrels less in storage.

• • •

OFFSETTING THE IMPROVEMENT achieved in gasoline supplies was a sharp rise in distillate fuel stocks, with some prices easing on the East and Gulf Coasts. Distillate stocks climbed to 83 million barrels by mid-August, 18 million greater than a year previous in contrast with being only 12.2 million barrels higher on June 1 than on the corresponding date of 1950.

Meanwhile, prospects for a large increase in winter demand for distillate fuel were not being enhanced by a continued decrease in new oil burner installations. May showed a decline for the third successive month, with installations down 28 percent from year ago figures, causing predictions that 1951 oil heating installations may be 13 percent under 1950 volumes.

Residual fuel oil inventories also were rising, reaching 47 million barrels by mid-August, up 5 million from a year ago, although they were 1 million barrels under 1950 on June 1.

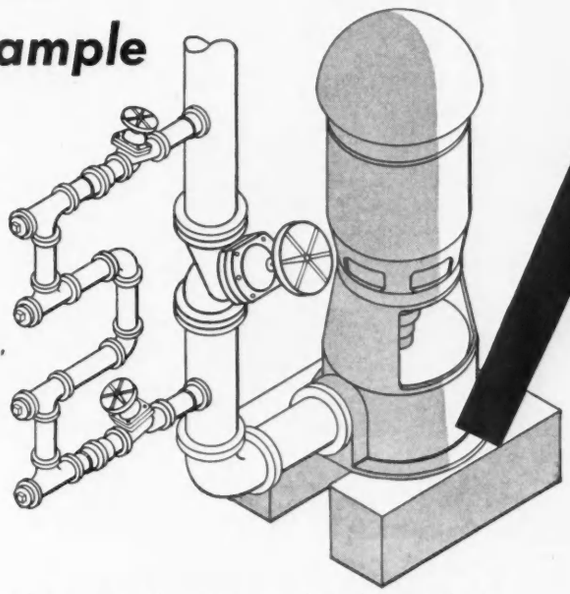
Combined inventories of the four major refined products (gasoline, distillate, kerosine and residual) on August 18 totaled 275.8 million barrels, up 36 million barrels from 1950 volumes. On June 1, these stocks were but 24 million barrels greater than the same date in 1950.

Further evidence of supply exceeding demand was the recent rise in crude stocks, which in totaling 252 million barrels in mid-August were 5½ million greater than on June 1 and 13½ million above year ago levels.

for outstanding service

on Corrosive Well Water

...for example



The Installation—
Barr Rubber Products Co.,
Sandusky, Ohio

PROBLEM: To eliminate costly seating and packing maintenance, and frequent replacement of valves on plant well-water pump. Valves previously used highly unsatisfactory, having maximum life of 6 months.

WORKING CONDITIONS: Sulphur content of water extremely high. Valve constantly exposed to severe corrosive and erosive effects. Operated infrequently; yet easy operation, positive seating are prime requisites.

SOLUTION TO PROBLEM: Crane Packless Iron Body Diaphragm Valves featuring separate disc and diaphragm design. Three-inch No. 1611 flanged end valve on main discharge; ¾-inch No. 1610 screwed end valves on by-pass.

RESULT: While other valves lasted only 6 months or less, Crane Diaphragm Valves show no effects of service, after more than a year. They operate smoothly . . . seat tightly . . . no maintenance whatsoever needed to date!

Another typical demonstration of superior quality, and the low-cost performance of Crane Valves. That's why . . . More CRANE VALVES are used than any other make!

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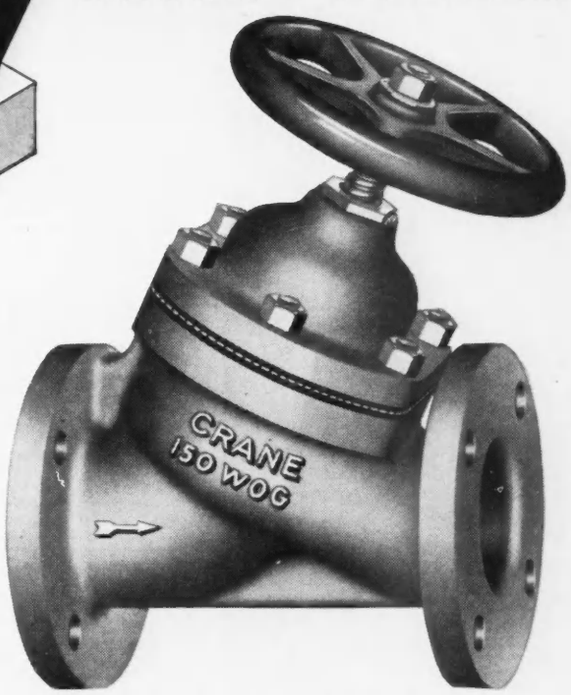

No. 1611 Crane Iron Body Diaphragm Valve —one of a full line suited for many services. Literature on request from your Crane Branch or Crane Wholesaler.

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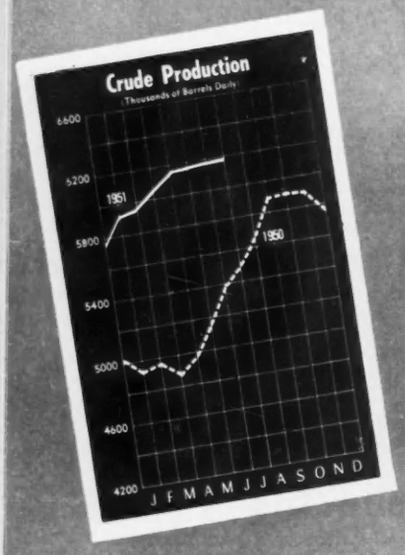
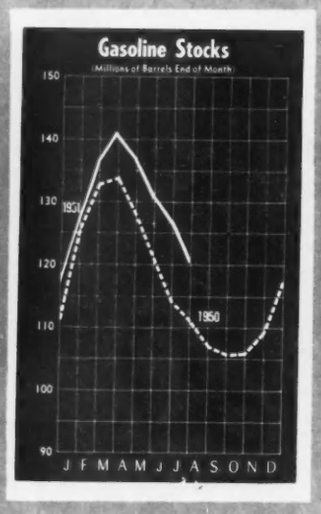
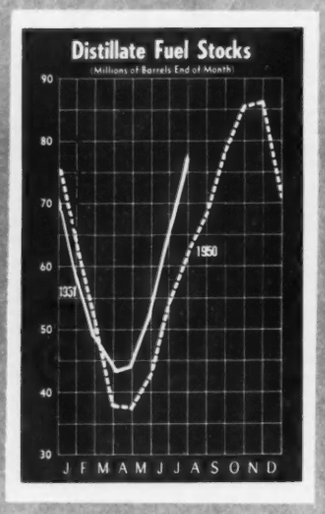
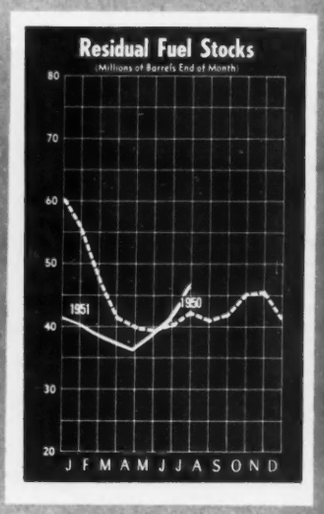
Petroleum

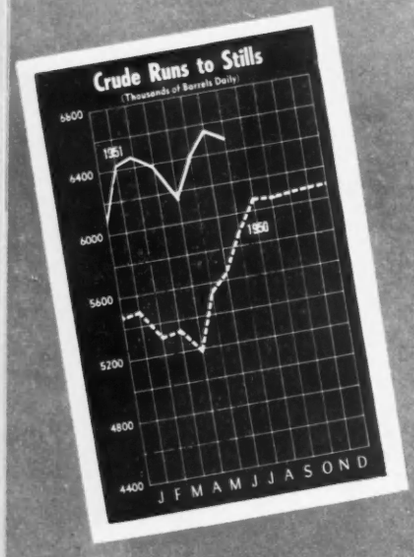
By CECIL W. SMITH











U. S. Crude Production by States

(THOUSANDS OF BARRELS)

STATE or DISTRICT	DAILY AVERAGE PRODUCTION				TOTAL PRODUCTION First Seven Months		
	July, 1951	June, 1951	July, 1950	% Diff. July '51-'50	1951	1950	% Diff. '51-'50
Alabama	3.1	3.0	1.9	+ 63.2	603	358	+ 68.4
Arkansas	81.1	82.2	85.0	— 4.6	17,297	18,165	— 4.8
California	977.7	969.3	881.9	+ 10.9	204,689	184,198	+ 11.1
Colorado	72.6	73.2	60.7	+ 19.6	15,762	12,804	+ 23.1
Florida	1.7	1.7	1.5	+ 13.3	342	244	+ 40.2
Illinois	170.4	170.1	166.3	+ 2.5	34,893	36,010	— 3.1
Indiana	30.3	30.1	28.0	+ 8.2	5,808	5,697	+ 1.9
Kansas	309.1	311.7	313.3	— 1.4	65,963	61,492	+ 7.3
Kentucky	29.4	28.0	28.6	+ 2.8	6,080	5,637	+ 7.9
Louisiana	642.2	646.2	586.5	+ 9.5	134,927	117,292	+ 15.0
North Louisiana	127.0	129.7	119.4	+ 6.4	26,062	25,893	+ 0.7
South Louisiana	515.2	516.5	467.1	+ 10.3	108,865	91,399	+ 19.1
Michigan	38.8	38.1	43.0	— 9.8	8,286	9,419	— 12.0
Mississippi	103.6	103.7	109.3	— 5.2	21,815	21,725	+ 0.4
Missouri	0.1	0.1	0.1	. . . .	14	16	— 12.5
Montana	25.0	25.0	22.2	+ 12.6	5,166	4,633	+ 11.5
Nebraska	6.4	7.	5.0	+ 28.0	1,589	580	+174.0
New Mexico	145.7	142.2	131.3	+ 11.0	30,065	27,350	+ 9.9
New York	13.9	14.2	10.9	+ 27.5	2,603	2,413	+ 7.9
North Dakota	. . . .	. . . .	. . . .	. . . .	3	. . . .	. . . .
Ohio	8.7	8.6	9.3	— 6.5	1,840	1,971	— 6.7
Oklahoma	506.3	505.6	461.7	+ 9.7	107,212	89,920	+ 19.2
Pennsylvania	28.4	29.1	32.4	— 12.4	6,559	6,747	— 2.8
Tennessee	0.1	0.1	0.1	. . . .	8	13	— 38.5
Texas	2,784.3	2,792.5	2,332.3	+ 19.4	574,922	440,222	+ 30.6
Dist. 1—South Central	33.2	33.0	29.5	+ 12.5	7,005	5,755	+ 21.7
Dist. 2—Middle Gulf	164.0	163.3	141.4	+ 16.0	34,288	26,241	+ 30.7
Dist. 3—Upper Gulf	492.0	501.2	412.5	+ 19.3	104,027	81,318	+ 27.9
Dist. 4—Lower Gulf-S.W.	257.3	261.4	221.1	+ 16.4	53,549	41,498	+ 29.0
Dist. 5—East Central	54.9	53.6	36.7	+ 49.6	10,757	6,719	+ 60.1
Dist. 6—Northeast	390.4	398.7	373.4	+ 4.6	82,158	72,136	+ 13.9
Dist. 7-B—North Central	82.0	87.1	72.2	+ 13.6	17,364	13,915	+ 24.8
Dist. 7-C—West Central	107.1	105.3	65.8	+ 62.8	20,589	11,717	+ 75.7
Dist. 8—West	958.2	941.9	776.1	+ 23.5	193,569	134,149	+ 44.3
Dist. 9—North	158.0	158.3	153.2	+ 3.1	32,495	29,385	+ 10.6
Dist. 10—Panhandle	87.4	88.6	92.5	— 5.5	18,874	19,278	— 2.1
Utah	3.6	3.5	3.3	+ 9.1	752	674	+ 11.6
Virginia	0.1	0.1	0.1	. . . .	11	13	— 15.4
West Virginia	7.7	7.6	7.4	+ 4.1	1,600	1,653	— 3.2
Wyoming	189.7	188.8	162.4	+ 16.8	40,061	33,472	+ 19.7
Total United States	6,180.0	6,181.9	5,484.5	+ 12.7	1,288,870	1,082,718	+ 19.0

Monthly News Analysis

Oil Earnings Misleading In Failing to Reflect Costs

The petroleum industry, along with the tire, paper, air transport and some other lines, showed better earnings than business in general for the first half of 1951, and oil companies likely will do so also in the latter half of this year. For a group of more than 30 oil companies, first half earnings were about 40 percent better this year than last year.

For business as a whole, January-June earnings were only about 7 percent better in 1951 than in 1950, and this improvement was possible only because the first quarter showed an increase of about 21 percent, as the second quarter showed a decrease of about 8 percent. For the latter half of 1951, financial analysts foresee earnings in general about 20 percent lower than in the booming latter half of 1950, with higher taxes and increased costs partially responsible, while volumes of business will be comparing with the booming sales of July-December, 1950. On that basis, business in general would have about 10 to 15 percent less profit for the year 1951 than for 1950.

Oil companies, similarly, will show less favorable comparisons with 1950 for the latter half of this year than for the initial half, as operations will be comparing against those of late 1950's boom period. However, largely because of continued exceptionally strong demand for petroleum products, oil company earnings generally should continue substantially above the 1950 trend, and for the year as a whole, there should be a considerable increase over last year.

Oil companies thus appear to be faring better than concerns in many other industries, and there is danger that the oil earnings will be misunderstood. In fact, they have been explained erroneously even by investment experts, as being due in substantial part to the percentage depletion allowance in the federal income tax law. Actually, that allowance played only a small part in determining that oil earnings were apparently better than average for U. S. business. The deductions for depletion and for intangible drilling costs necessarily were only moderately larger in 1951 than in 1950, in line with increases in production and drilling.

In reality, the higher reported oil industry earnings for this year have been due mainly to two factors: (1) substantially larger volumes of business, with demand for oils breaking all records; and (2) failure of allowable bookkeeping deductions from earnings for replacement of facilities to cover the still rising actual costs of those facilities.

Oil prices are frozen at pre-Korea levels, though wholesale prices of all commodities in the aggregate are up 13 percent and wages in oil and gas production are up 10 percent. Each barrel of oil the industry is now producing must be replaced for future needs. But with material and labor costs now substantially higher, the oil companies should be setting aside more out of earnings for replacement of wells and plants than they actually are allowed to do under the tax regulations. If they could be thus adequately covering replacement needs, the oil companies would be reporting larger deductions for reserves and lower earnings. As it is, the reported earnings are partially artificial, unreal, and a mirage that will disappear in the air when replacement wells are drilled and new plants are built at current or future higher prices and costs.

Unrealistic Restrictions Threaten Fuel Oil Market

Complications which inevitably arise under artificial and arbitrary determination of prices currently are illustrated in the East Coast fuel oil market.

Shortage of heating oils during the coming winter in the New England and Middle Atlantic regions is in prospect unless price control authorities make adjustments in ceiling prices to permit independent suppliers to cover increased tanker costs.

In formally requesting such adjustment, independent suppliers pointed out that nearly 18 percent of the 53,815,000 barrels of No. 1, 2, 3, and 4 fuels used in 1950 in New England and the Middle Atlantic states were bought in the spot market f.o.b. the Gulf by 27 of the total of 38 independent primary suppliers to the areas.

U. S. Crude Hike Results From Curtailed Iran Output

Record-breaking crude production in the U. S. in September will reflect especially the disruption of the flow of oil from Iran into world trade because of the Iranian oil industry nationalization.

The prospective stepping up of U. S. output to a new all time high level will be achieved primarily by higher allowables in Texas, ordered by the Railroad Commission at request of Petroleum Administration for Defense.

The Texas allowable of 3,059,367 barrels daily ordered for September is 76,861 barrels more than the August 11 allowable. In addition to this increase, there will be increases of about 10,000 barrels per day per week arising from completion of new wells claiming allowables. The Midland, West Texas, district's allowable was raised 30,507 barrels to 1,053,059 barrels daily. Output in that area will reach capacity of pipe line outlets and may force some crude into storage.

Higher Texas production in September will be in line with recommendations of most major and independent crude purchasers heard by the Railroad Commission. A spokesman for an independent refiner mentioned difficulty in buying enough crude, and one for a major company told of sales to Gulf Oil Corporation and others for export to fill deficiencies in Western Europe's supply caused by loss of Abadan refinery output. One major company buying Texas crude reported stocks near minimum levels.

In the week ended August 18, U. S. production of crude and condensate reached a new all time peak of 6,240,850 barrels daily, with Texas producing 2,811,000 daily that included 971,450 daily in District 8 of West Texas and 110,650 daily in District 7-C of West Texas.

At the Railroad Commission hearing at mid-August in preparation for setting September allowables, a spokesman for PAD estimated that the U. S. could produce and transport about 175,000 barrels a day more than the prevailing 6,200,000 barrels per day of production, including 150,000 more in Texas and 25,000 in the Middle West. Railroad Commissioner

An Open Letter to the Oil and Gas Fraternity

PERMIAN BASIN OIL SHOW

113 WEST 3RD
ODESSA, TEXAS

Mr. John Johnson
World Wide Oil Industries
Anytown, Anywhere

Dear John,

Consider this a personal invitation to you and every other person concerned with the production and processing of oil and gas, to "show or go" to the '52 Permian Basin Oil Show to be held in Odessa, Texas, in October of next year.

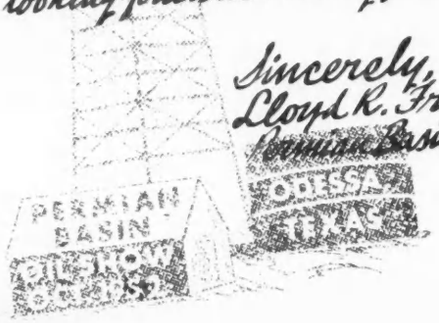
I'm sure you remember the great turnout for the show last year when over 200 companies from 18 states exhibited and that some 50 others had to be turned down for lack of space. Our '52 show will offer more and better facilities for showing but there will also be more exhibitors—so don't be late—start planning now!

Don't forget that Odessa is in the heart of the vast Permian Oil Basin and you'll be showing to a huge audience of oil field workers, all interested in the latest innovations in oil field equipment and service.

You'll want to keep up with news of the show, plans for entertainment, who will be here, and so on—so send us the coupon at the bottom of the page and we will include you on our mailing list.

I'll be looking forward to hearing from you—SOON!

Sincerely,
Lloyd K. French, Pres.
Permian Basin Oil Show



Permian Basin Oil Show
113 West 3rd
Odessa, Texas

Include me on your mailing list for news and plans of the '52 Oil Show.

Name _____

Address _____

City _____ State _____

W. J. Murray, Jr., explained that Texas could efficiently produce more than 150,000 barrels per day extra but could not put more into the markets due to pipe line limitations.

FPC Wants Early Court Review of Phillips Case

The Federal Power Commission has indicated hope that its action declining to assert regulatory powers over Phillips Petroleum Company as a natural gas company would be promptly reviewed in the courts.

The commission stated that it was of "the utmost importance that there be an early and conclusive answer to the question whether we have erred in refraining from asserting jurisdiction over sales made in the process of production and gathering throughout the 13 years under the Natural Gas Act."

FPC on August 23 had issued an opinion and an order supporting its previously announced decision that it does not have juristiction over Phillips as a "natural gas company" under the Natural Gas Act. The commission stated that Phillips was engaged in "production and gathering" natural gas and therefore exempt from the act. It added that the company's movement and sale of natural gas in interstate commerce, together with processing operations constituted part of the company's gathering business or were incidents or activities related to it.

While Congress specifically exempted production and gathering from FPC regulation, said the commission, relevant court decisions and FPC's own decisions during 13 years of administering the act also indicate that FPC has no jurisdiction over transportation or sales made in the process of production or gathering. One member of the commission disagreed with the majority opinion and wrote a dissenting opinion.

PAD Will Assist in Gaining Deferments for Key Oil Men

Petroleum Administration for Defense at the request of the National Petroleum Council has established a policy of assistance in getting deferments from or a delay in calls to active military duty for key personnel in the petroleum and gas industry. PAD will assist if the person involved falls in one of the following categories:

- A key managerial or executive official or one in an occupation included in the list of critical occupations published by the Department of Labor or in an occupation equally critical in essential petroleum operations.
- Engaged full-time in an activity included in the list of essential activities published by the Department of Commerce, or in the production of oil field equipment and machinery, tetraethyl lead, catalysts or similar items for which PAD has responsibility.
- Irreplaceable without material loss of effectiveness in the activity in which the person is engaged.
- Adequately trained for the work in his occupation.

PAD will refuse to intervene in cases of graduates of service academies, recent graduates of Reserve Officer Training Corps programs, cases involving only hardships to the individuals concerned, and instances of the person to be deferred not approving the application for special consideration.

Requests for assistance in obtaining delay or deferment in cases meeting the requirements should be addressed to the Manpower Division, Petroleum Administration for Defense, Washington 25, D.C.

Steel for Fourth Quarter Continues in Tight Supply

Indications point to a slight increase in steel for the domestic oil and gas industry in the fourth quarter, but rising demands of producers foreshadow a continuation of the extremely tight supply situation.

Petroleum Administration for Defense received an allocation from Defense Production Administration of 1,806,500 tons for distribution to the nation's producers. While this quota is nearly 330,000 tons less than the minimum requested for the October-December period, it is 228,000 tons larger than was allocated PAD for use during the current quarter. Of the latter allocation PAD estimated delivery was received on no more than 85 percent of the total, and there are no present assurances that the percentage of actual oil industry steel shipments will be appreciably higher during the fourth quarter.

Total industry demand, however, continues to run well ahead of available supply. PAD approved only slightly more than one-half of the total requests filed for fourth quarter oil country tubular goods purchase authorizations. While the total requests probably reflect an amount above true real needs, they do indicate that a subsantial demand for steel exists above present allocations. Approved purchase authorizations for fourth quarter amounted to approximately 325,000 tons of drill pipe, tubing and casing out of total bids for 1,158,000 tons. Petroleum Administrator Bruce K. Brown said the latter amount is the equivalent steel for drilling 26,000 wells, compared with the 11,000 programmed by PAD for the domestic industry for the quarter. PAD's requested minimum tubular goods allocation for the fourth quarter was 437,000 tons for domestic producers.

Steel industry shipments of oil country tubular goods during the first six months of this year amounted to 944,270 tons, an increase of 15 percent over the corresponding period of 1950. The January-June shipments were equal to an average of 157,378 tons per month, or only slightly less than the 157,500-ton-a-month rate that will have to be maintained to meet PAD's goal of 1,890,000 tons of tubular material for its 1951 drilling program of 43,400 new wells.

Shipments of line pipe, however, continue to run well below 1950, with the total for the first half of this year of 1,492,037 tons down 16 percent. While deliveries of tubing, casing and drill pipe by the steel industry have increased steadily from a low of 130,000 tons a month early in the year to 167,838 tons in June, shipments of line pipe have shown greater lags as the year progresses, due to rising demands for steel plate, from which large diameter pipe is made, by defense and other defense-supporting industries. June shipments, totaling 259,360 tons, were nearly 24 percent under the like 1950 month, or a larger decline than shown in the full six months period.

While it is probable shipments of oil country goods for all of 1951 may run better than the 157,500-ton monthly required rate, there are no expectations of any early improvement in line pipe deliveries. DPA officials report only 2,480,000 tons of steel plate will be available in the fourth quarter, assuming needed scrap will be found, to meet a national demand under the Controlled Materials Plan of more than 3,000,000 tons. DPA placed total petroleum industry demand, including pipe line and refineries, for steel plate at 750,000 tons for the fourth quarter. Earlier, PAD in its request for fourth quarter allocations estimated absolute minimum line pipe demand at 1,200,474 tons, of which 650,000 tons consisted of 16-inch and larger sizes. Steel plate requirements of the refining branch were not included in that total.

Revised Forms Are Required To Purchase Tubular Goods

Petroleum Administration for Defense has issued revised forms to be used for priorities assistance for purchase of oil country tubular goods, commencing with operators' applications for drill pipe, tubing and casing to be manufactured in the first quarter of 1952. Requests on the new forms for drill pipe for the first three months of next year must be filed with the agency no later than September 15 and applications for casing and tubing should be submitted on or before September 30.

The revised forms being mailed by PAD are PAD-15, PAD-16, PAD-17 and PAD-17DP.

PAD-15, used in applying for casing and tubing for wildcat wells, as revised will provide for fuller explanation of the specific well location involved and details of previous exploratory work, if any, in the surrounding area.

PAD-16, used in reporting inventories of unused casing and tubing, drilling history and future drilling program, has been changed primarily in reference to the quarterly periods covered. Heretofore this form requested individual operator's drilling history for the year 1950. As revised the form calls for such history for the four quarters immediately preceding the quarter in which the application is filed. This change will free operators from basing successive requests for priorities assistance on their record of performance in 1950. The new PAD-16 form, if filed with a PAD-17 quarterly application for scheduled casing and tubing requirements for the first quarter of 1952, for example, calls for the applicant's drilling history for the last two quarters of 1950 and the first two quarters of 1951, since the application is submitted in the third quarter of 1951.

The only major change made in PAD-17 is the inclusion of provisions for reporting tonnages of casing and tubing needed for maintenance and repair of existing wells. This will provide for replacing pipe that may become corroded in existing wells. A few minor details also have been changed in the revised form relative to clearing up misunderstanding of the data requested.

PAD-17DP, the quarterly form showing total inventory of drill pipe on hand and requirements for new drill pipe, has been reworded slightly. A printed sheet of suggestions covering preparation of the forms also has been prepared by PAD.

Operators will receive sample copies of the revised form by mail and additional copies may be obtained from PAD, Interior Building, Washington 25, D. C. They also may be obtained from PAD field offices in New York and Chicago, U. S. Department of Commerce field offices, state petroleum regulatory offices, oil field equipment supply houses and petroleum and natural gas trade associations.

Priorities Program Aids Foreign Oil Operations

National Production Authority in mid-August established a priorities assistance system to help petroleum operators get materials for foreign operations. The new system is provided in NPA order M-46A covering all petroleum operations in countries other than the U. S. and Canada, the latter two being covered by order M-46A. The new order, to be administered jointly by PAD, the Commerce Department's Office of International Trade, and the Economic Cooperation Administration, covers two cotegories of foreign operations.

Those involving a large construction operation (a single complete construction project for which the material cost exceeds $10,000) require filing PAD form 26A with the Office of International Trade. If approved, the operator may place priority delivery orders using a new set of symbols which vary by countries and material requested.

For all other operations, including production, small construction, maintenance, repair, operating supplies and laboratory equipment, operators' supplies are requested through PAD which must approve such projects before a request for priority ratings will be permitted. The designated form for this type of material allocation is IT-824 and must be filed quarterly while operations using essential materials are underway PAD form 26A only has to be filed once for a complete operation.

Expansion Slowdown Ordered For Natural Gas Suppliers

A slowdown in the extension of natural gas service to new customers in 15 states east of the Mississippi and the District of Columbia was ordered by Petroleum Administration for Defense effective August 22. The regulation, designed to prevent shortages of gas needed for defense production and essential civilian uses particularly during the heavy consuming winter months, is a much watered-down version of the original proposal of the government agency made late in June.

The order as finally promulgated prohibits extension of natural gas service to new large volume consumers and to central space-heating customers in the specified areas except under certain circumstances. In the case of large-volume (industrial) consumers the major condition under which the order would not apply is that in which the service is fully interruptible and the gas to be used is not needed for underground storage. Service would also be permitted in any case for which specific PAD approval had been obtained. This latter group would include high-priority defense industries.

Three specific exemptions from the limitation order, applicable to central space-heating consumers, are provided as follows:

- In any community to which the order applies, a natural gas seller may during the next 12 months take on new customers to the extent of 1 percent of the total number of customers of all kinds served in that community on August 22.
- In any community that previously had no gas distribution of any kind, or where the manufactured gas service was to less than 5000 consumers, the seller may take on as many customers as he choses during the first two years after the beginning of such distribution.
- In any community previously served with some other gas than natural gas but recently converted to natural gas, a seller may, during the first two years after conversion, take on new customers up to 10 percent of the total number of customers of all kinds at the time of conversion.

The original PAD proposal would have placed a flat ban on taking on new natural gas customers in the above states plus portions of Missouri, Iowa, Minnesota, Nebraska and South Dakota as a move to head off extra demand for gas that suppliers might be unable to fill because of critically tight large diameter line pipe. This proposal was protested by appliance manufacturers and some congressmen from the affected states. The result was that Representative Bow of Ohio had the Defense Production Act amended to permit state public regulatory agencies with authority to regulate natural gas to supercede any order restricting gas use issued under the Defense Production Act, provided the state agency certifies to the president it would assume the responsibility for its gas supply.

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Completions Continue At High Rate in July

DRILLING was maintained at a high rate during July and the resulting number of completed wells was the second highest so far this year. The peak was reached a month earlier. That vigorous drilling activity resulted in a record number of wells and amount of footage being drilled during the first seven months of this year.

A total of 3915 wells were recorded during July, and that was second only to the 4125 completed during June for the year's highest. The 15,108,807 feet represented in the wells finaled during July was also the second highest monthly footage total this year. Again the peak had been hit a month earlier. Not only was July's footage this year's second, but it was also the second of all-time. June's total footage had been the highest in history.

At the end of seven months, total wells completed in the U. S. amounted to 25,105, while a year ago at the same time they had totaled 24,406. That represented a gain of 2.9 percent for the current drilling campaign.

The gain in the amount of footage drilled this year was somewhat greater. In seven months, a total of 95,313,366 feet were drilled and that amounted to 7.5 percent more than the 88,637,416 feet recorded in the comparable period of 1950.

At the end of July, there were 4989 rigs actively engaged in drilling wells and that was not only a high for the year, but was the highest mark since the end of November, 1948.

Well Completions in the United States During July, and First Seven Months, 1951

(Figures compiled by WORLD OIL Staff from private reports and other sources as follows: Illinois from Illinois Geological Survey; Indiana from Indiana Division of Geology; Missouri from Missouri Geological Survey; Tennessee from Tennessee Division of Geology; Bradford, Kane-Clarendon and Allegany fields of Pennsylvania and New York from the "Producers Monthly.")

State or District	MONTHLY COMPLETIONS, JULY, 1951									TOTAL COMPLETIONS				CUMULATIVE TOTALS January-July					Rigs in Operation (Drilling, Rigging-Up and Shut Down)		
	NEW WELLS																				
	Oil	Dist.	Gas	Dry	Water Input	Gas Input	Water Disposal	Total New	Total Drilled Deeper	July, 1951	June, 1951	July, 1950	Footage July, 1951	Wells 1951	Wells 1950	Percent Diff.	Footage 1951	Footage 1950	July 31, 1951	June 30, 1951	July 31, 1950
Alabama	1			2				3	1	4	4	5	14,131	35	24	+ 45.8	160,499	97,782	4	3	4
Arizona												3		2	3	— 33.3	3,820	14,103	2		5
Arkansas	22		1	20				43	1	44	33	40	149,642	225	226	— 0.5	784,482	747,410	35	29	26
California	143		2	39	1			185	6	191	242	184	818,037	1,401	1,088	+ 28.8	5,365,065	4,409,164	253	201	210
Colorado	8		1	11				20		20	30	11	96,705	129	30	+330.0	722,846	107,334	30	31	17
Florida				1				1		1			330	2	9	— 77.8	2,014	59,087	1	2	2
Georgia															3	—100.0		13,270			
Idaho														1	3	— 66.7	12,844	8,540			3
Illinois	96			184				280		280	233	340	750,643	1,273	1,514	— 15.9	3,215,855	3,227,295	214	207	274
Indiana	47			81	2			130	1	131	115	160	251,138	619	880	— 29.7	1,124,111	1,514,148	176	174	210
Kansas	193		38	165				396		396	352	386	1,345,865	2,327	2,211	+ 5.2	7,911,843	7,140,658	439	427	362
Kentucky	42		19	61				122		122	147	144	252,299	704	630	+ 11.7	1,420,052	1,139,342	104	93	116
Louisiana	73	9	10	86				178		178	186	207	1,227,702	1,183	1,387	— 14.7	7,723,957	8,433,244	227	223	234
North Louisiana	36	3	5	52				96		96	108	106	414,022	622	716	— 13.1	2,423,045	2,520,522	73	77	75
South Louisiana	37	6	5	34				82		82	78	101	813,680	561	671	— 16.4	5,300,912	5,912,722	154	146	159
Maryland			1	3				4		4	5		15,623	19	1	+1800.0	74,090	3,612	26	24	2
Michigan	20		1	38				59		59	86	79	153,589	401	462	— 13.2	1,023,673	1,088,725	102	111	145
Mississippi	22		2	26				50		50	31	30	285,190	203	210	— 3.3	1,314,434	1,533,110	37	43	26
Missouri												1		3	23	— 87.0	658	14,585	6	6	6
Montana	19		1	10	4			34		34	25	12	84,388	142	117	+ 21.4	317,292	321,355	57	58	42
Nebraska	4			7				11		11	13	11	47,971	82	48	+ 70.8	374,238	197,822	12	9	12
Nevada														2			15,431		2	2	1
New Mexico	26		16	17				59		59	70	55	260,059	393	350	+ 12.3	1,831,988	1,551,402	117	121	98
New York	30				21			51		51	49	80	72,949	306	421	— 27.3	435,368	634,759	63	61	99
North Carolina																					
North Dakota	1			2				3		3			23,154	4			28,763		7	4	2
Ohio	42		16	33				91	6	97	89	90	187,744	514	550	— 6.6	1,014,056	1,150,911	167	162	148
Oklahoma	225		13	149	13	1	2	403	18	421	488	440	1,466,560	3,159	3,036	+ 4.1	11,331,296	10,487,250	616	614	619
Oregon																					1
Pennsylvania	58		14	6	57	4		139	3	142	150	155	251,712	846	918	— 7.9	1,474,384	1,665,209	262	239	263
South Dakota															1	—100.0		5,710	1		1
Tennessee				4				4		4	2		6,595	6	3	+100.0	7,465	3,993	9	5	9
Texas	849	9	58	567	3		1	1,487	25	1,512	1,667	1,455	6,772,917	10,337	9,559	+ 8.1	44,560,729	40,515,903	1,651	1,567	1,425
Dist. 1 S. Central	20		1	14				35	2	37	43	36	120,685	342	270	+ 26.7	996,640	736,734	34	36	28
Dist. 2 Middle Gulf	18	2	1	32				53	1	54	69	62	332,069	436	378	+ 15.3	2,507,917	2,185,576	62	60	57
Dist. 3 Upper Gulf	85	1	14	46				146		146	157	139	898,747	912	910	+ 0.2	5,610,912	5,312,436	125	142	129
Dist. 4 L. Gulf-S.W.	83	4	11	66				164	5	169	196	121	780,827	1,015	951	+ 6.7	4,960,117	4,537,226	125	123	101
Dist. 5 E. Central	19		1	23				43		43	46	16	155,266	279	114	+144.7	1,046,775	467,232	34	29	21
Dist. 6 Northeast	43	2		19				64		64	67	50	358,079	436	361	+ 20.8	2,194,337	1,726,925	42	45	39
Dist. 7-B N. Central	105		4	135				244	1	245	280	193	750,237	1,585	1,128	+ 40.5	4,485,780	3,162,416	196	192	126
Dist. 7-C W. Central	66			43				109	1	110	123	88	559,606	799	498	+ 60.4	3,500,262	2,099,009	173	148	89
Dist. 8 West	272		2	50				324	13	337	374	395	1,862,624	2,325	2,422	— 4.0	12,547,508	13,048,130	470	441	514
Dist. 9 North	118			132	3		1	254	2	256	254	291	784,793	1,757	1,966	— 10.6	5,277,765	5,463,617	267	250	220
Dist. 10 Panhandle	20		24	7				51		51	58	64	169,984	451	561	— 19.6	1,432,716	1,776,602	123	101	101
Utah	1			2				3		3		1	26,850	15	10	+ 50.0	71,777	30,434	24	22	9
Virginia																			1	1	1
Washington															2	—100.0		16,032	1	1	
West Virginia	11		36	9				56	1	57	44	65	165,436	351	364	— 3.6	1,016,206	906,776	220	204	260
Wyoming	51		1	23				75	2	77	64	57	381,578	421	323	+ 30.3	2,074,130	1,598,451	123	118	80
Total U. S.	1,984	18	230	1,546	101	5	3	3,887	64	3,951	4,125	4,011	15,108,807	25,105	24,406	+ 2.9	95,313,366	88,637,416	4,989	4,762	4,712

Continued Growth of Oil Industry Depends on Unencumbered Economy

An interview with

A. E. BRADSHAW
President, National Bank of Tulsa

EDITOR'S NOTE: *A. E. Bradshaw has been in the banking business in Tulsa for fifty years. He might be classed as a pioneer in the field of oil financing, and as president of one of Tulsa's leading banks he knows the oil industry from all angles.*

Reared on a farm in southwest Missouri, Bradshaw taught school for a short time and then moved to Tulsa and started in the banking business. In addition to his position as president and director of the National Bank of Tulsa, Bradshaw is also director and chairman of the board of Oklahoma Natural Gas company. He has for many years been prominent in the cultural and business life of Tulsa and has given freely of his time and effort in the promotion of enterprises contributing to the city's growth and welfare. He is a past member of the Advisory Council of the Federal Reserve Board and also past president of the Oklahoma Bankers' Association.

Q. *From the standpoint of a banking institution putting up funds for use in the petroleum industry, what are some of the principal factors favoring the oil industry's future outlook?*

A. The basic factor involved in the favorable outlook is the continuing growth in the importance of oil in our expanding economy. Consumption seems to increase, rather than satisfy, the American public's appetite for petroleum products. This year U. S. crude oil production has been averaging almost 6,200,000 barrels daily—an increase of 60 percent in the past ten years and 30 percent in the last five years. Every indication points to further expansion in the years ahead.

From a banking standpoint, a rapidly growing industry naturally offers investment possibilities more attractive than those for industries subject to little or no growth. In the case of oil, tremendous and recurring capital requirements are a normal occurrence. The added stimulus of ever-greater market needs results in a particularly encouraging prospect for oil investments.

While no segment of our economy is depression proof, the petroleum industry would seem to be in a fortunate position as to the dangers of recession. Oil products become more of a necessity and less a luxury with each passing year. Increased amounts of energy in the form of heat and power are indispensable to our way of life and petroleum is called upon to furnish most of these added energy needs.

A. E. BRADSHAW

From the short-range view there are many factors favoring the banker's interest in oil. The mobilization of natural resources under a defense program places unusual emphasis on petroleum. Both military and non-military requirements are involved, as the nation can neither prepare for, nor engage in, war activities without the assurance of adequate oil supplies. Certainly, defense policies should encourage the flow of capital and materials into the petroleum industry. Banking institutions will be called upon to play an important role in this effort.

Q. *Similarly, what are some of the principal unfavorable factors, uncertainties, and hazards that must be taken into account?*

A. While the oil outlook appears generally favorable from a banking standpoint, there are areas of uncertainty. These are largely political and economic.

In my opinion, the most important

unknown is the course of future actions by the federal government regarding fiscal policies, taxes, prices, wages, and industrial controls. That course has been marked by indecision, vacillation and political expediency. The lack of clear-cut and consistent programs makes it necessary to appraise the many favorable factors with some reservation.

Large scale military expenditures create inflationary pressures that affect our entire economy. The resulting pressure for increased taxes carries with it the danger of sacrificing sound long-term tax policies in the hope of immediate—and often discriminatory—price or wage regulations, or restrictive controls over industrial activity could have unusually severe repercussions on the oil industry. Payouts would be affected, and, even more important to the industry and to bankers, there would be less incentive to continue the necessary flow of risk capital. I doubt that any other major industry would be as adversely affected by impairment of business freedom.

Experience has demonstrated that purely wildcat or exploratory activities alone are too uncertain to provide a basis for loans. Supplemental security is required, and the stability of such security is endangered by the above-mentioned unfavorable factors.

Q. *What serious threat is posed to future investment in the petroleum industry by reason of higher taxes and proposed changes in the tax laws?*

A. Investment in the producing branch of the petroleum industry more properly might be referred to as reinvestment. The sale of a barrel of crude involves the disposition of a capital asset. Oil production, therefore, is actually a process of liquidation. It is equivalent to a grocery store selling a part of the building with every can of soup. To stay in business, the oil producer must reinvest a part of his sales dollar in searching for and developing new producing properties.

Tax provisions affect to an unusual degree this investment, or reinvestment, in petroleum operations. Both the amount of funds available and the incentive to expend the funds are a function of these provisions. Obviously, higher taxes reduce the availability of risk capital in the petroleum industry as well as all other industries. More important, however, proposed changes in sections of the federal tax laws pertaining directly to oil and gas constitute a serious threat to petroleum investment.

The provisions of the federal income tax laws relating to oil and gas were designed to recognize the basic principle that the sale of a capital asset should not be taxed as income. Recognition was also given to the hazards and losses involved in the search for oil and the need, in the public interest, to provide a stimulus to the investment of risk capital. The proposals to reduce the allowance for depletion and amend other related provisions inevitably could have but one result, namely: less capital invested, less exploration, less oil and finally higher prices to the consumer. That would be not only poor business from an investment point of view, but dangerous national policy.

Q. *How are the above factors likely to affect the borrowing position of oil operators and companies?*

A. As stated above, I believe the oil outlook is more favorable than unfavorable and the borrowing position from that standpoint should be improved. This conclusion necessarily must be qualified by many uncertainties.

Both the oil man and the banker are influenced more by their appraisal of the future than by the circumstances of the moment. The return on invested capital depends upon conditions over an extended period. When there is a firm basis for confidence, industry is encouraged to proceed in an orderly manner and loan values are stabilized. When fear or doubt control, the natural reaction is to hesitate in taking even the normal risks.

It is unfortunate that the petroleum industry has not been given full encouragement in its expansion plans. On the one hand, defense agencies are calling for more production and greater reserve capacities. On the other, the threat of unsound tax charges and discriminatory prosecution creates an atmosphere of distrust and suspense. Only partial assurance has been given that sufficient materials will be allocated to oil and gas operations. Until these problems are resolved on a basis that looks to greater oil supplies in the national interest, the oil operator and banking institutions necessarily must temper their plans with considerable caution.

Q. *Describe the influences in government and business circles which are likely to affect, for better or for worse, the availability of purely risk capital required to expand exploratory or wildcat drilling.*

A. From a business standpoint, the availability of risk capital should be increased by the increased income resulting from expanding oil demands, both civilian and military. This gain in available funds may be offset in part, or in full, by higher costs, inadequate prices or excessive taxes.

Government influences, therefore, can well be controlling as to the increase or decrease in risk capital. Here the danger signals are clear. Federal price controls have had the effect already of causing oil prices to lose ground as compared with other prices and wages. The inevitable result has been increasing costs and less funds available for risk ventures. Tax changes that fail to make proper provision for the hazardous nature of petroleum exploration would have the greatest detrimental effect upon the availability of capital.

Q. *In its relations with the petroleum industry in connection with the defense program, what are some of the things, from a banking standpoint, that the government can and should do to improve the oil industry's position but without imposing further control?*

A. Summarizing my views on the outlook for petroleum financing, I believe that it is essential that the federal government under a mobilization program give proper recognition to:

- Tax provisions necessary to provide the funds and the incentives to permit the full development of the nation's oil and gas resources.
- Price and wage policies that take into consideration costs and the requirements for risk capital.
- The priority need for materials for basic industries essential to defense.

In conclusion, it seems to me that the government can and should replace the present atmosphere of uncertainty with an economic and political climate of faith and encouragement. My personal experiences with the petroleum industry have justified my conviction that the resoursefulness of the industry is unlimited when it is not hampered by restrictive influences. The challenge of the times is great indeed. To meet this challenge there must be a free flow of capital on a scale unknown before. This can be accomplished only through the freedom of the individual to profit or lose in a competitive society.

What New Reserves Can We Expect to Find In the Permian Basin?

By DR. SIDON HARRIS
President, Southern Geophysical Company, Fort Worth

THE PERMIAN BASIN of West Texas and Southeast New Mexico still offers important possibilities for discovery of additional oil reserves, despite the many discoveries already made. This article discusses the potentialities in each of several portions of the region, as indicated by present accumulations of geological and geophysical evidence. Geophysical work may be expected to aid materially in finding new fields, while subsurface geology will continue important in guiding exploration. While many entirely new fields undoubtedly will be opened, other sources of additional reserves will include extensions of presently established fields and new, deeper, Pre-Permian pay zones still lying undiscovered under the shallow Permian production of some fields.

A LITTLE more than 25 years ago, just prior to the discovery of the Big Lake Permian field of Reagan County and the Yates shallow field of Pecos County, many competent geologists felt that the Permian Basin of West Texas had little if any potentialities from the standpoint of petroleum reserves. They believed that this area consisted largely of "red beds" to the depth of any then economic reach of the drill.

The discovery of the two mentioned fields set off a vigorous campaign for additional shallow Permian production in the late 1920's and early 1930's, resulting in discovery of substantial petroleum reserves, principally on the Central Basin Platform, designated as Area 2 in Figure 1. During this campaign of 20 years ago or more, many tests to a depth of 4000 or 5000 feet were abandoned as dry in the center of what is now prolific Pre-Permian production. Two dry holes were within a stone's throw of the discovery well of the Lower Permian Fullerton area of western Andrews County—a very prolific field, which also was developed later at Pre-Permian depth.

Early in 1940 an extensive Pre-Permian exploration on the Central Basin Platform (Area 2, Figure 1) was set off by the discovery of Pre-Permian production in Pecos County at the Abell pool. Thus, nearly 20 years after the discovery of shallow Permian production in West Texas, a search for Pre-Permian reserves was initiated in earnest. This play resulted in the discovery of many millions of barrels of Pre-Permian reserves on the Central Basin Platform. The close coordination between known geological data compiled by the subsurface geologists, some core drilling, and the use of all known geophysical methods, including magnetic, gravity, and seismograph, combined to form an exploration team which certainly paid dividends to the operators and the country as a whole, when there was a scarcity of petroleum supplies during World War II.

Although perhaps some additional substantial reserves will be located on the Central Basin Platform, it begins to appear that this particular province in the Permian Basin has been pretty thoroughly combed, and for the past few years, operators have been spreading out.

Within the past five years attention has been focused on the so-called Pennsylvanian Reef production, which

Seismic engineering party obtaining vertical and horizontal control for shot points, Midland County.

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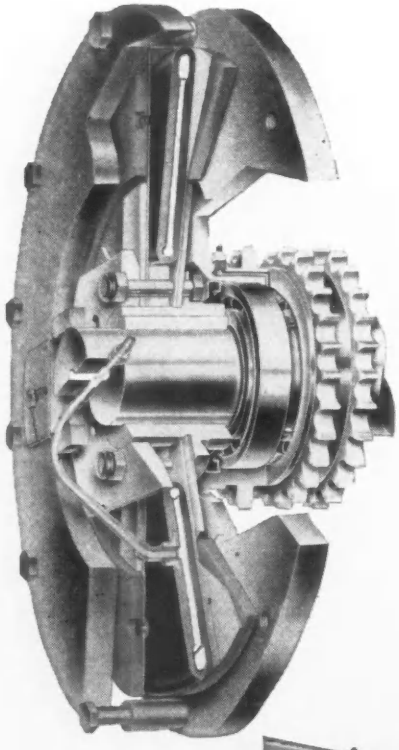

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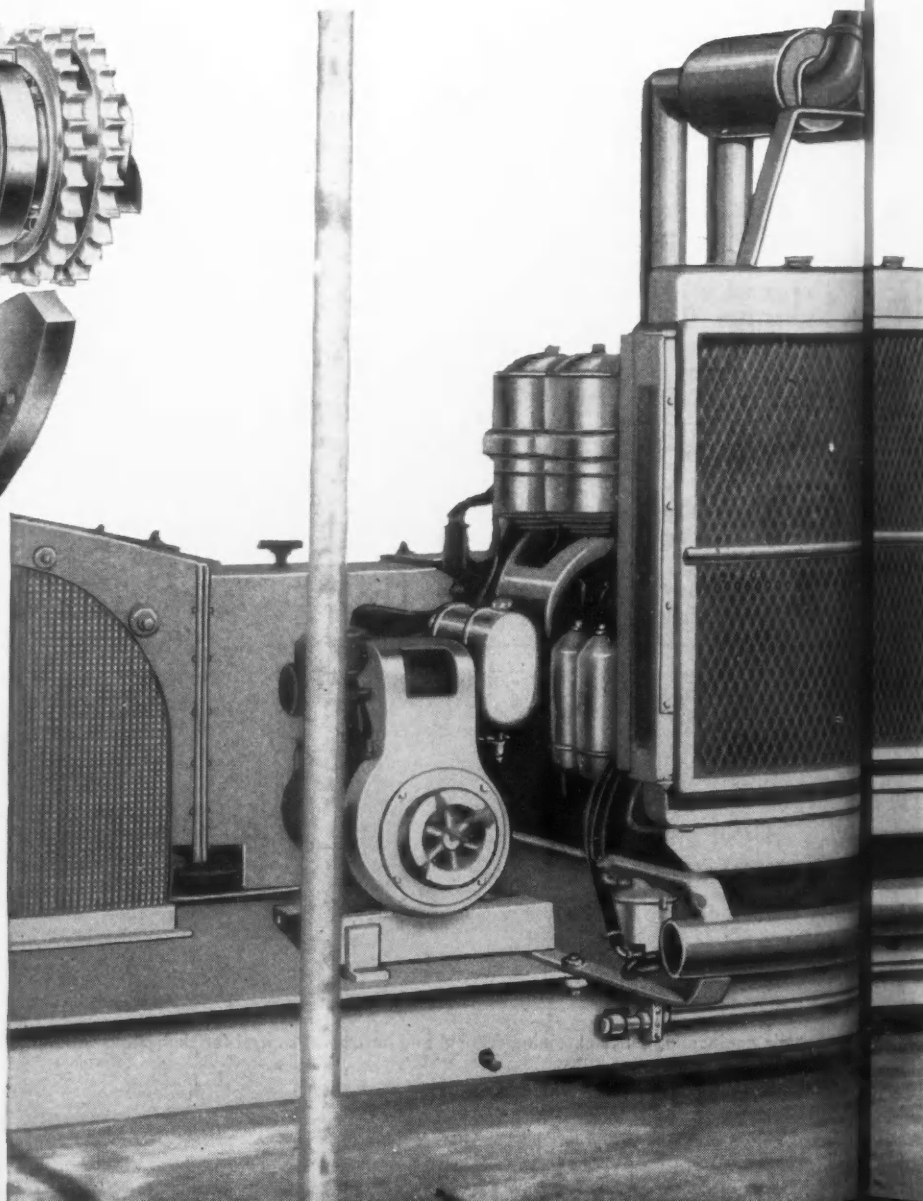

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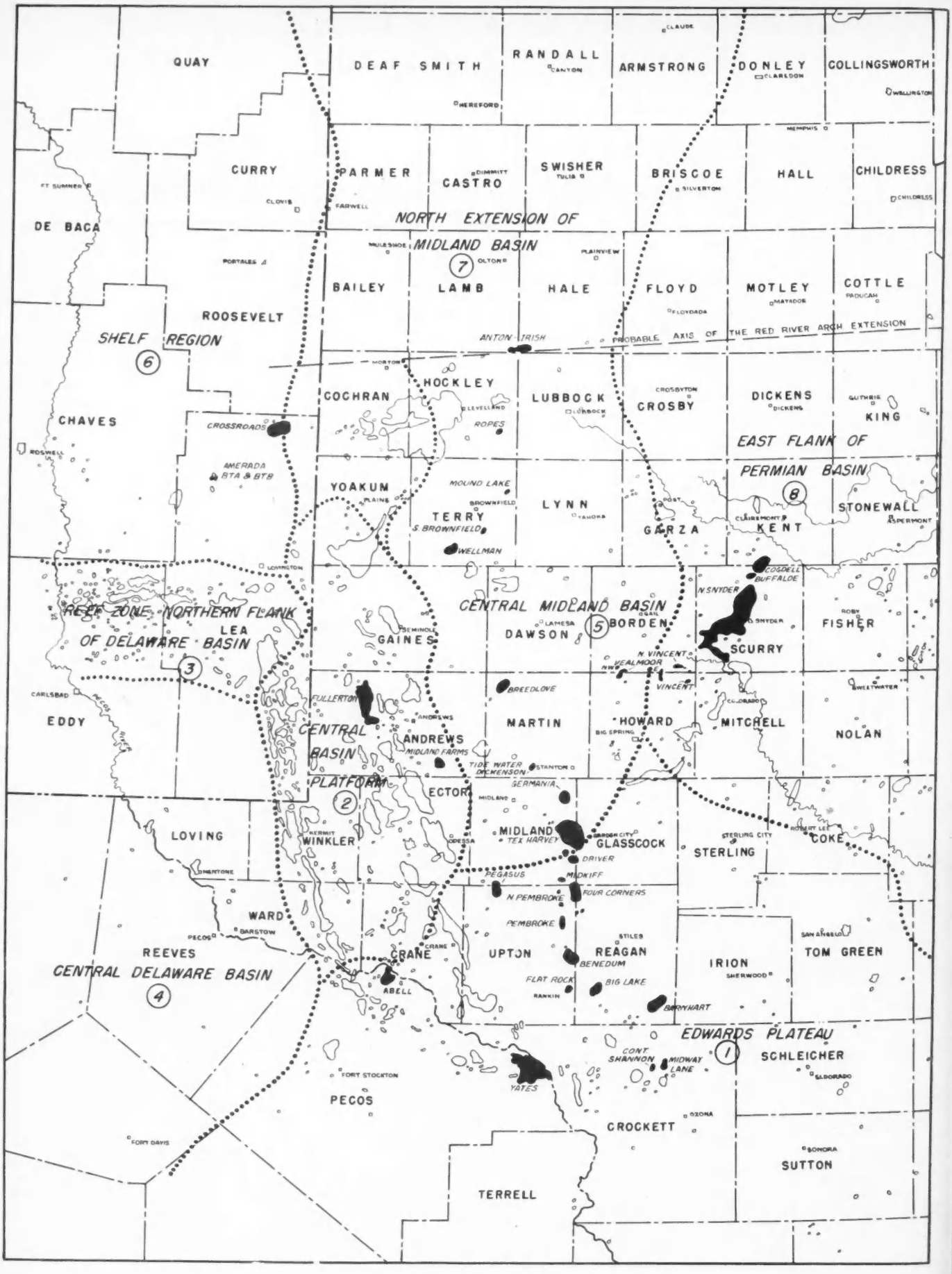


FIGURE 1. MAP OF MIDLAND BASIN AND SURROUNDING PROVINCES SHOWING OIL AND GAS FIELDS.

was initially brought to attention by the discovery of the Jameson field in northwestern Coke County by Sun Oil Company, followed rather closely by the prolific reef production in the Pennsylvanian section in Scurry County, including the North Synder field discovered by Standard Oil Company of Texas.

More recent reef discoveries in the northern part of the Central Midland Basin in Terry County, including the Wellman Reef field by Anderson-Prichard Oil Corporation, the South Brownfield Reef discovery by Union Oil Company, the Mound Lake Reef discovery by Seaboard Oil Company, and the Ropes field by Honolulu Oil Corporation in southeastern Hockley County, have accentuated the search for further reef lime discoveries in the northern portion of the Central Midland Basin (Area 5, Figure 1), principally in Terry, Hockley, Lynn, Dawson, Borden, Garza, and Kent counties.

In the early 1940's the Edwards Plateau, which offered many obstacles to geophysical methods, especially the seismograph, gained some recognition by discovery of the Barnhart pool in Reagan County by Amerada Petroleum Corporation. That discovery set off a rather extensive refraction seismic campaign, which to date has not been too encouraging, although the discovery of the Midway Lane field by Sinclair Oil and Gas Company in northern Crockett County added impetus to the effort. Very recently the showings obtained at Continental Oil Company's Shannon 1 in north central Crockett County have revived some interest in the Edwards Plateau, and activity from a geophysical standpoint in this particular province (Area 1, Figure 1) is now increasing.

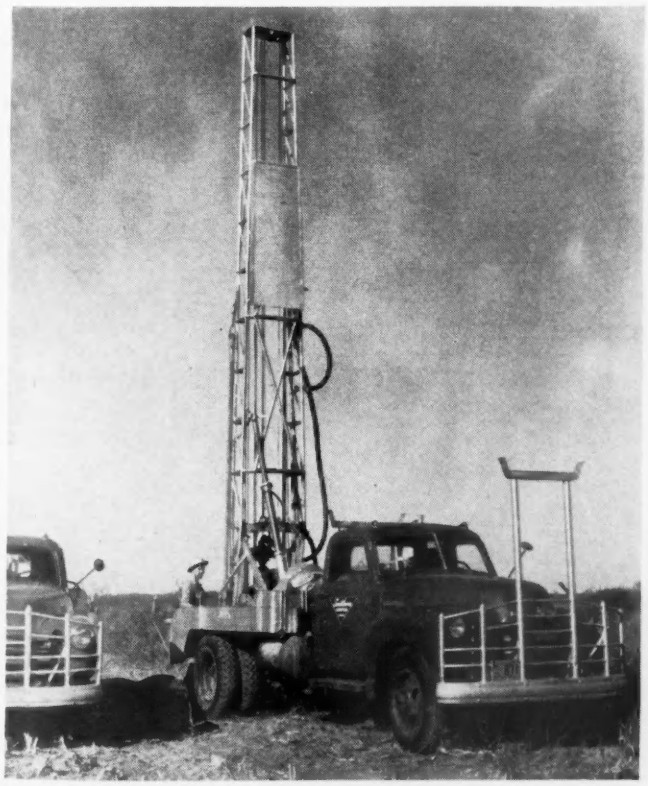
The discovery of deep Devonian production in northern Lea County, New Mexico, by Mid-Continent Petroleum Corporation at the Crossroads field set off quite an extensive exploration campaign in the Shelf region of eastern New Mexico, including the northern portion of Lea County, the eastern half of Chaves County, and a large section of Roosevelt County, New Mexico. Interest in this area was substantially increased a few months later by the discovery of the Amerada BTA and BTB Devonian fields, and considerable activity is going on in this province (Area 6, Figure 1).

Although practically no encouragement has been obtained to date north of the Red River arch extension, indicated in Figure 1 as running along the south lines of Cottle, Motley, Floyd, Hale, Lamb, and Bailey counties, considerable exploration activity is at present in progress in this province (Area 7, Figure 1), especially in Swisher, Castro, Randall, Armstrong, Deaf Smith, Briscoe, Floyd, and Lamb counties. So far, the Anton-Irish field, situated in the southwest corner of Hale County (Area 7, Figure 1), is perhaps the most promising producing field along the axis of this arch, and at the moment is the northernmost penetration of production in the Midland Basin proper.

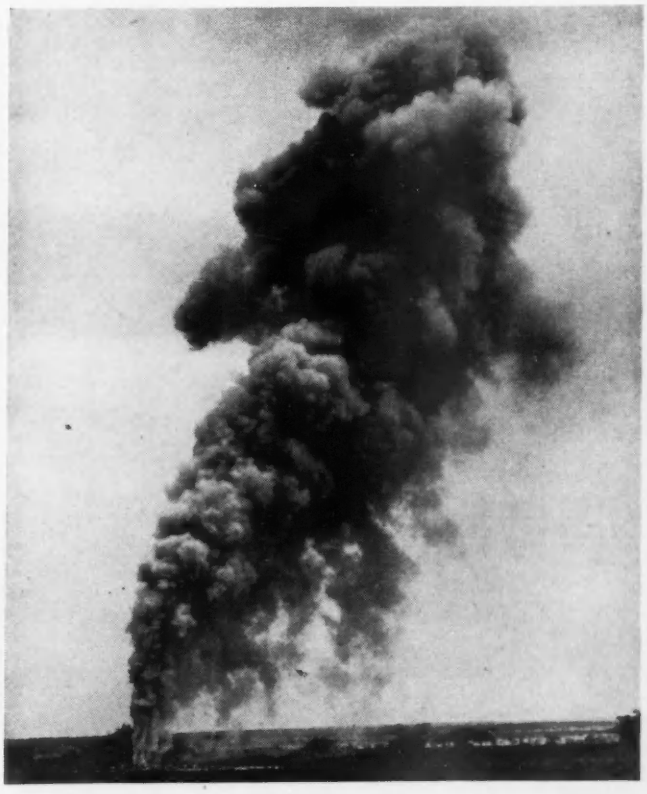
Considerable knowledge with reference to the prediction of future developments can usually be acquired by taking a "look backward," which we have just done. The Permian Basin of West Texas still offers perhaps as much potentialities as any producing province in the U. S. with reference to the discovery of new petroleum reserves.

● In spite of rather tightly held leases and the high exploration cost, there undoubtedly will be additional Pre-Permian reserves discovered on the Central Basin Platform. However, this particular province of the Permian Basin does not offer too much attraction to operators from the standpoint of general exploration, followed by the purchase of favorable acreage for the drilling of a test. Additional exploration will be confined largely to operators who already hold undeveloped acreage in the area.

● Undoubtedly, considerable additional exploration will be done along the East Flank of the Permian Basin (Area 8, Figure 1) and along the northern section of the Central Midland Basin (Area 5, Figure 1), searching for additional Pennsylvanian Reef production, which is definitely amenable to the seismograph continuous



Heavy duty seismic shot hole drill unit in action, Terry County, Texas.



Hole blow following detonation of refraction charge, Crockett County.

line reflection technique. A typical seismograph reflection record obtained in Terry County in the vicinity of the Wellman area is shown in Figure 2.

● The recent Siluro-Devonian production, obtained at the Pan American-Forest-Houston Breedlove 1, in northwestern Martin County as well as excellent showings recently obtained in Tide Water Associated Oil Company's Dickinson 1 in south central Martin County, will lead to a further search for Siluro-Devonian and Ellenburger production in the central and southern portions of the Central Midland Basin (Area 5, Figure 1), which is also quite amenable to the reflection seismograph. A typical reflection seismic record in the vicinity of the Breedlove is shown in Figure 3.

● Discovery of deep production in both the Devonian and Ellenburger at Benedum field along the east line of Upton County by Plymouth Oil Company and the recent good showing obtained by Continental at its Shannon 1 in northern Crockett County undoubtedly will accentuate further exploration on the Edwards Plateau, where in general the seismic refraction technique will have to be employed. A typical seismic refraction record obtained in Crockett County is illustrated in Figure 4.

● Present activity in Area 6, Figure 1, centering in northern Lea County, New Mexico, with the seismic reflection methods undoubtedly will continue for some time.

● The present high level of seismic and other exploration activity in the north extension of the Midland Basin, north of the Red River Arch (Area 7, Figure 1), probably will continue for another year or so, until additional disappointments are obtained or this activity is further activated by discovery of substantial production in the Pennsylvanian Reef section or at lower levels. This area offers considerable advantages to the operators, inasmuch as it is not as tightly held as other portions of the Midland Basin from the standpoint of acreage, and due to the fact that large blocks can still be obtained at more or less reasonable costs.

● The Central Delaware Basin Area (Area 4, Figure 1) offers many knotty exploration problems, especially from the standpoint of seismic exploration, but undoubtedly will receive considerable play in the coming years, through a combination of the refraction and reflection techniques, supplemented to some extent by "slim hole drilling" and careful velocity surveys obtained in the "slim" holes.

● Perhaps one of the greatest tools in searching for additional reserves in the Permian Basin is the careful restudy and re-investigation of the areas in the vicinity of deep dry holes which appear to be abnormally high. For example, the Standard of Texas Brown 1, which led to the discovery of the North Snyder Reef production

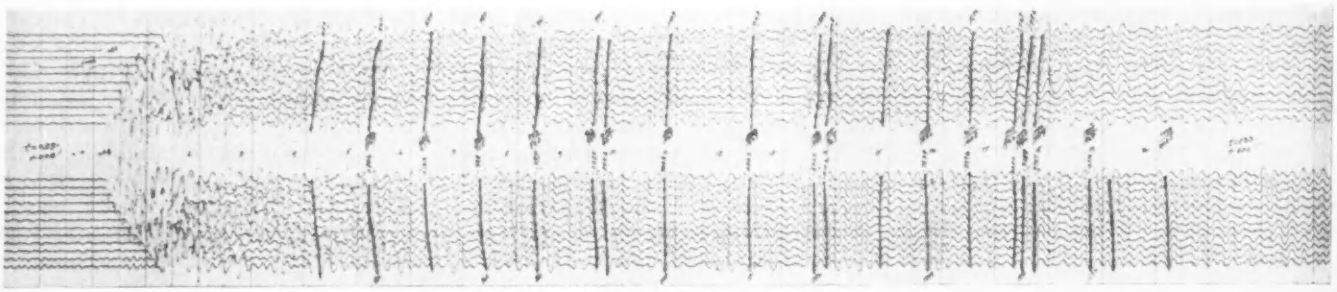


FIGURE 2. Typical seismic reflection record from survey leading to discovery of Wellman pool, Terry County, Texas.

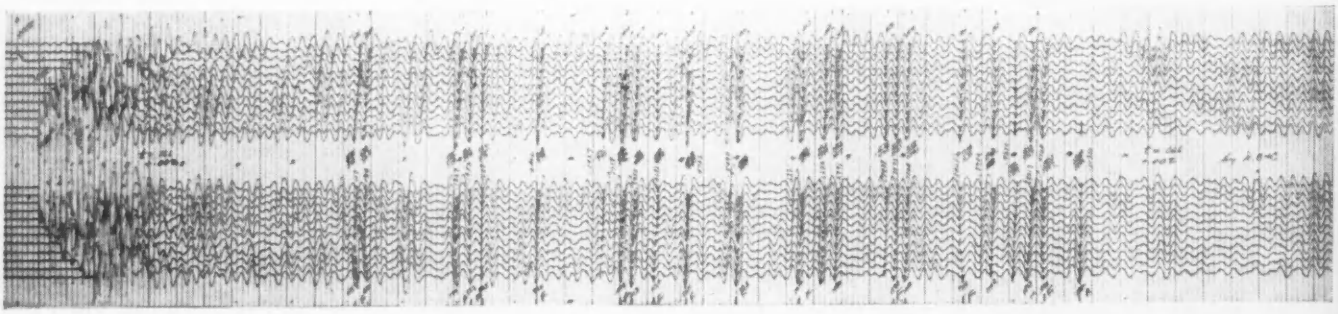


FIGURE 3. Typical seismic reflection record used in survey leading to discovery of the Pan American-Forest Oil-Houston Oil Breedlove 1, Martin County, Texas.

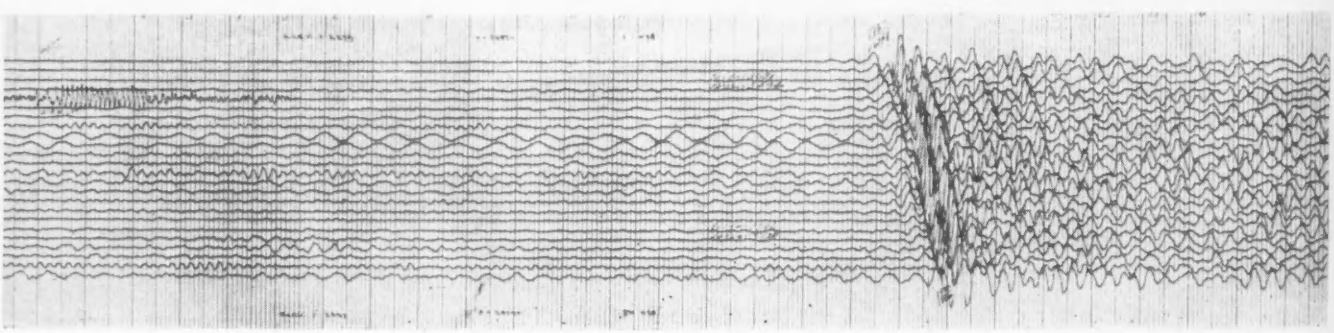


FIGURE 4. Typical refraction seismic record, Crockett County, Texas.

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Typical recording and shooting unit employed in seismic exploration in West Texas.

in Scurry County, was situated scarcely three miles from a deep dry hole. And, in addition, the Pan-American-Forest-Houston Breedlove 1 of Martin County is approximately two miles from a deep dry hole. Careful investigation of the geologic section in the drilling of wildcat wells will also improve the discovery rate, and currently most operators are drilling their wells "all the way" to the Ellenburger, to thoroughly exhaust potentialities of the entire geologic section.

● Extensions of known producing fields will be another source of additional reserves in the general area, such as the recent extension of the Midland Farms pool in southeastern Andrews County by Anderson-Prichard Oil Corporation and Stanolind Oil and Gas Company, which produces in the shallow Permian section.

● The development of the Permian Spraberry production along the eastern line of Midland County and vicinity undoubtedly will justify further investigation of this portion of the geologic section northward into Martin County and perhaps Dawson County. Although the Spraberry is considered by some to be more of a "geological trap" than production due to structure, it can be noted to date that most Spraberry production is over deep-seated seismic highs.

● Last but not least we always have the possibility of deep Pre-Permian production underlying shallow Permian production. A few of these deep tests have been drilled to date in the older Permian fields, some with success and some without. In general, it can be safety assumed that most of the shallow Permian production is rather closely associated with deep Pre-Permian structure. However, the deep structure does not always coincide exactly with the shallow anomaly; and before staking a deep test in a known shallow field, it is suggested that as much additional seismic work be completed as possible prior to the staking of a deep test.

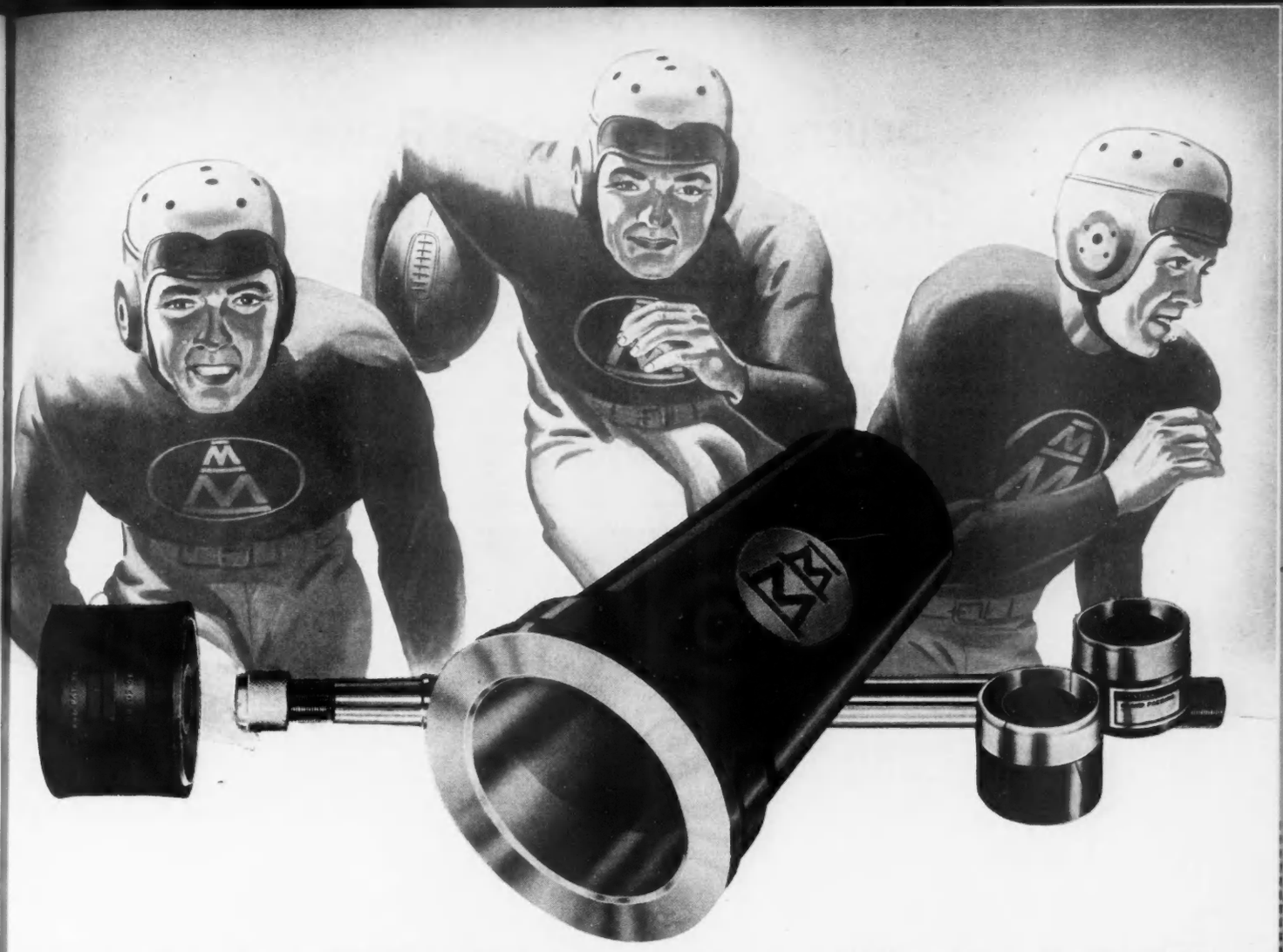
Seismic recording truck setting up for refraction shot in Crockett County, Texas.

About the Author

DR. SIDON HARRIS, president and general manager of Southern Geophysical Company, Fort Worth, entered the geophysical profession in 1929, when he became associated with Humble Oil & Refining Company, after receiving B.A. and M.A. degrees in physics from the University of Texas. After four years of graduate work at Rice Institute and the University of Texas, he received a Ph.D. in physics in June, 1934.

He served a brief time on the faculty of Oklahoma A. & M. College and then joined Western Geophysical Company, where he remained until 1938, at which time he was transferred to the Geophysical department of Stanolind Oil & Gas Company. Dr. Harris resigned his position of division seismograph supervisor in November, 1944, to organize Southern Geophysical Company.

He has wide experience in all producing provinces in Texas, Oklahoma, Kansas, New Mexico, Louisiana, Arkansas and California. He is a member of Phi Beta Kappa, Sigma Xi, SEG, AAPG, American Physical Society, Geophysical Union, and is past president of the Fort Worth Geophysical Society. At present he is president of the Fort Worth Longhorn Club. Dr. Harris has published numerous articles in scientific and trade journals in this country and abroad.



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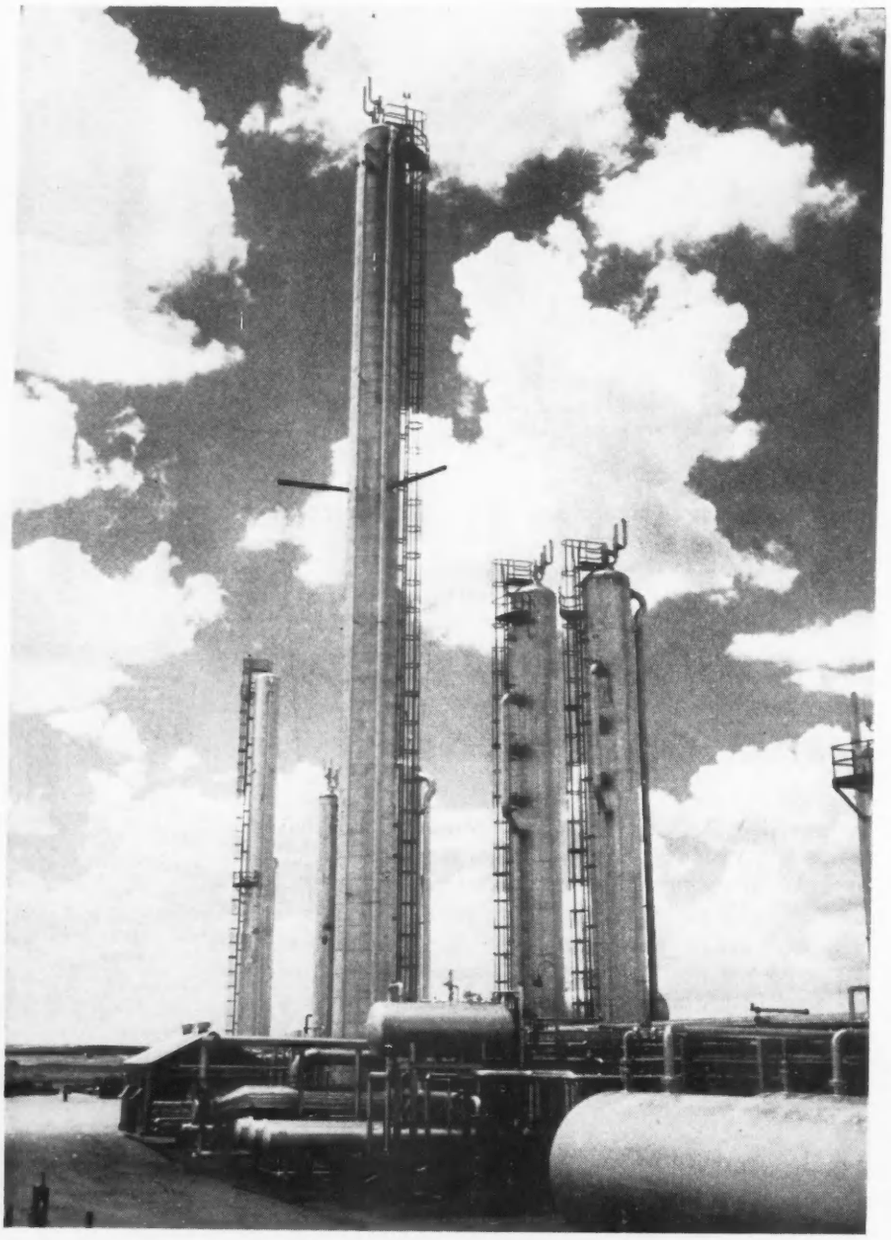
Scurry Conservation Plans Envisage Billion Barrel Payoff

ENGINEERING STUDIES are under way for a huge pressure maintenance program in the Canyon Reef pools of Scurry County, Texas. It is believed that by unitizing the 85,000 productive acres and carrying out a pressure-maintenance program, it will be possible to produce 2 billion barrels of oil instead of the 1 billion that could be recovered under present production methods—out of 4 billion barrels in place in the reservoir. Plans contemplate controlled injection of both gas and water.



Conservation already is being achieved on an important scale in the Scurry County reef fields through natural gasoline plants that recover liquid hydrocarbons from the casinghead gas from oil wells and save the residue gas. These fractionating columns, effecting separation of light hydrocarbons, are at the Snyder natural gasoline plant of Sunray Oil Corporation and associates. (Photo by E. J. Mills, superintendent of the plant.) Under plans now contemplated, residue gas from several plants of this kind in the area, as well as gas from outside sources via pipe line, would be injected into the reef reservoir, while water also would be pumped in, to maintain the reservoir pressure and increase the recovery of oil.

ONE of the most important conservation projects ever considered by the oil industry is being studied in the Canyon Reef pools of Scurry County, Texas. Engineers believe that by unitizing the approximately 85,000 productive acres, a pressure-maintenance program can be successfully carried out which will ultimately result in the additional recovery of 1 billion barrels of oil, or twice the amount that can be expected under present production methods.

The Scurry County Canyon Reef pools comprise the second largest limestone reservoir in the Western Hemisphere. The combined pools of Sharon Ridge, Diamond "M," Kelly-Snyder and Cogdell represent the largest development during 1950 and have been described as the second largest oil reservoir in the U. S. with reserves estimated at 4 billion barrels.

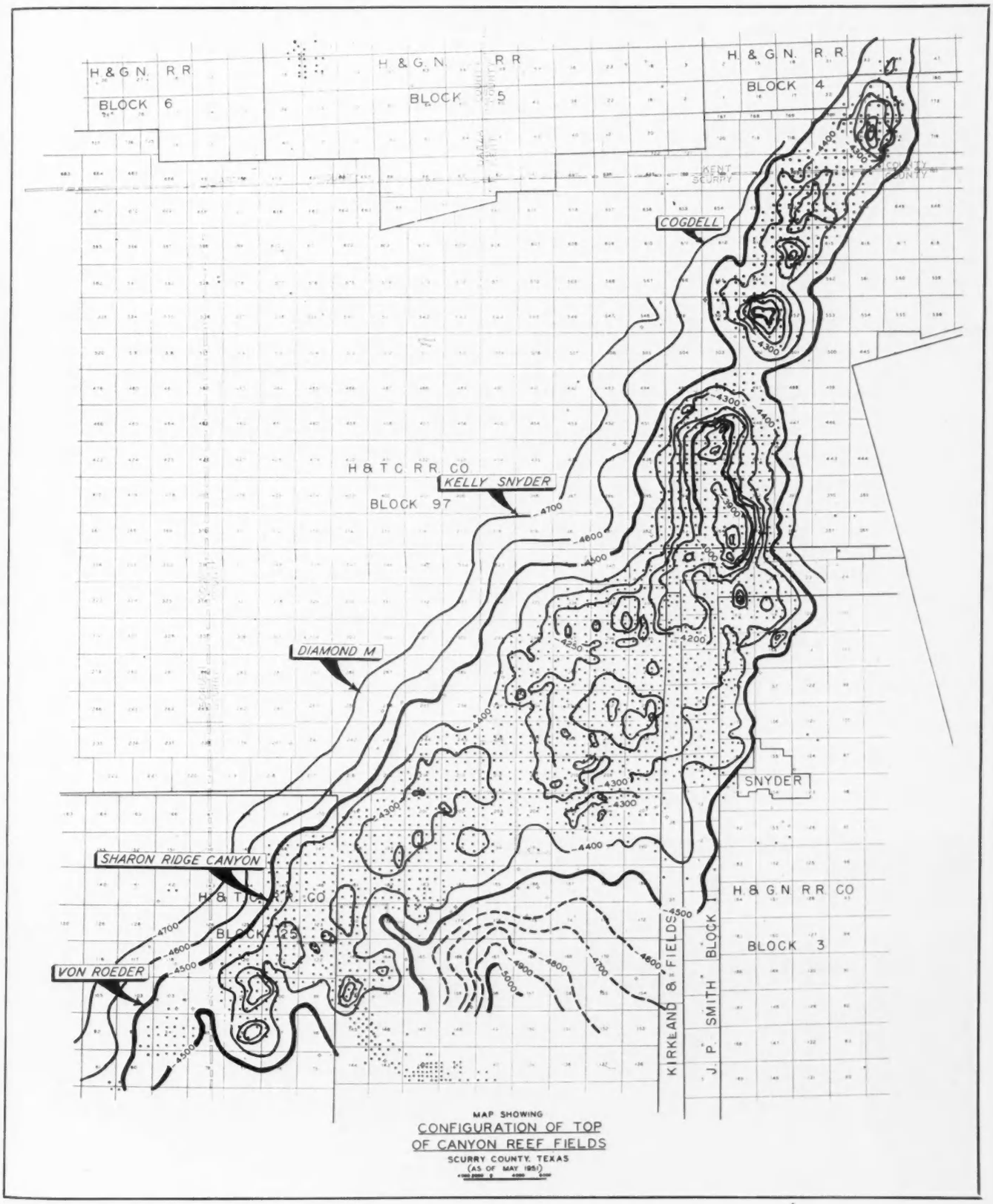
Under present production methods only about 25 percent of the estimated 4 billion barrels will be recovered during the economic life of the area. Under unit operation and with controlled injection of both gas and water, the recovery will be doubled.

Securing the agreement of all parties presents a formidable task, but already 75 percent of the operators have expressed formal approval. Since Texas has no law which can compel unitization, to become effective there must be voluntary acceptance by enough of the operators to make the plan practical. The plan has the approval of the Texas Railroad Commission which already has expressed alarm at the rapid decline of pressure in this great field. While the Texas Railroad Commission has no power to force unitization, it has in the recent Shafter Lake Devonian field entered an order requiring pres-

sure maintenance, and it is probable such an order may be forthcoming in the Scurry area unless voluntary action is taken by the operators.

Conservation of this vast oil reserve is of particular importance at present because of the defense effort and because of adverse political conditions in the Middle East, where there is imminent danger that the supply of oil from Iranian fields will be cut off from the Western World.

The drilling program in the area is nearing completion, and a decision must shortly be made in order to halt the decline of reservoir pressures. The chief technical problems are those of reservoir engineering, involving the geometry of the pools, the nature of the reservoir and its contents, and the production expected to be obtained from different methods of operation. Methods which are being evaluated include all



SCURRY COUNTY REEF FIELDS.

known methods of pressure maintenance by gas and fluid injection.

Tests on core samples from typical wells show that the Canyon Reef is suitable for water-drive operation. From laboratory tests to date engineers conclude that the lime is preferentially water wet, so that water moving through the limestone will adhere to it and permit the oil to float free. Water-displacement tests on the cores indicate an average of about 47 percent of the oil in place. Other tests show that the cores exhibit effective permeability to oil, with pore space occupied up to 45 percent by gas phase. For these reasons engineers recommend the injection of both water and gas into the Canyon Reef.

The Scurry County Canyon Reef area is approximately 40 miles long and eight miles wide, located about 200 miles west of Fort Worth and 60 miles northwest of Midland, Texas. Production is from a large buried limestone reef, of Pennsylvanian age, covering an area of more than 130 square miles, with up to 750 feet of gross saturated reef thickness. Production is obtained between depths of 6500 to 7000 feet, and the average elevation of the ground is 2500 feet above sea level.

The reef is bioherm, eroded to its present shape, and covered entirely by shale. Its surface has a more gentle slope to the northwest, and the steeper east and southwest flanks are believed to be on the seaward side. A few wells in the field have produced from Pennsylvania sand lentils in the lower several hundred feet of shale above the reef. Between the eastern edge of the reef several wells are producing oil from layers in limestone of Strawn age, and still lower a few wells have found production in the Ellenberger dolomite. Regionally, the field is on the east side of the Midland Basin, as are most of the other reef fields of Pennsylvania age. The reef mass was built up on top of the limestone of Mississippian age overlying Ellenberger dolomite. The idea has been originated[1] that the absence of major separations of nonlimestone material between the base of the reef and the top of the Ellenberger aided materially in trapping oil in the reef. The development of the continuous limestone section and the relative absence of noncalcareous sediments between the Ellenberger formation and the base of the reef is explained by a granite arch in the Scurry County area, present before and during the development of the reef bioherm. Later the regional west dip of 30 feet per mile was established by tilting of the area.

First Reef Well

The first well to penetrate oil-saturated limestone in the Scurry County pool was drilled in Sect. 339, Block 37, H & T C Ry. Co. Survey, about six miles northwest of the town of Snyder. Although approximately 230 feet of the reef above water level were penetrated, no testing of the reef was undrtaken, and the hole was abandoned in January, 1947. The well has since been reworked and is now producing from this reef.

In July, 1948, the reef was discovered productive in Sect. 186, Block 97, six miles southwest of Snyder. But prolific reef production was not discovered until November, 1948, when Standard Oil Company of Texas completed No. 1 Brown-2 well in Sect. 440 of Block 97, with 664 feet of reef limestone above water table. Additional wells over a large area thereafter indicated the productive possibilities of the reef play.

In December, 1948, the Lion Oil Company completed its McLaughlin 2 well, 15 miles southwest of Standard's discovery to open the Diamond "M" field, and in March, 1949, Humble Oil & Refining Company discovered the Sharon Ridge reef area, south and southwest of Diamand "M."

In December, 1949, Chapman and McFarlin found reef production in Cogdell 1, Kent County, 30 miles northeast of Sharon Ridge.

Similar fluid and reservoir charasteristics were found in each of the producing areas, which cover approximately 85,000 productive acres, as follows: Sharon Ridge, 11,000; Diamond "M," 18,000; Kelly-Snyder, 43,000 (these three are considered as one continuous reservoir); Cogdell, 13,000.

During January, 1951, more than 1650 wells produced in excess of 3.5 million barrels. Sharon Ridge and Diamond "M" accounted for 8 and 18 percent, respectively, of the four fields' combined production; Kelly-Snyder, 61 percent; and Cogdell, 13 percent. Cumulative production from the four fields up to February 1, 1951, totaled 45.3 million barrels as follows: Sharon Ridge, 3.2 million; Diamond "M," 8.2 million; Kelly-Snyder, 30.5 million; Cogdell, 3.4 million.

The allowable, which is based one-half on acreage and one-half on wells, was 2300 barrels per well per month for March, 1951, on the basis of 40-acre spacing. As of December 15, 1950, nine-tenths of the wells were on assigned areas ranging in size from 35 to 50 acres.

As previously stated, stock tank oil originally in place is estimated at 4 billion barrels, which has been determined both by volumetric and material balance calculations. For the volumetric calculations, water table is assumed at 4450 feet subsea in Sharon Ridge, 4506 feet subsea in Diamond "M" and Kelly-Snyder, and 4550 feet subsea in Cogdell.

Oil produced from the Scurry County reef is higher in gravity and gasoline content and lower in sulfur and residium than typical West Texas crudes. The bubble point in Sharon Ridge is 1890 pounds per square inch compared to 1946 psi in Diamond "M" and 1725 to 1866 in Kelly-Snyder, a trend being toward lower

Night view of the Scurry County field during the height of drilling activity.

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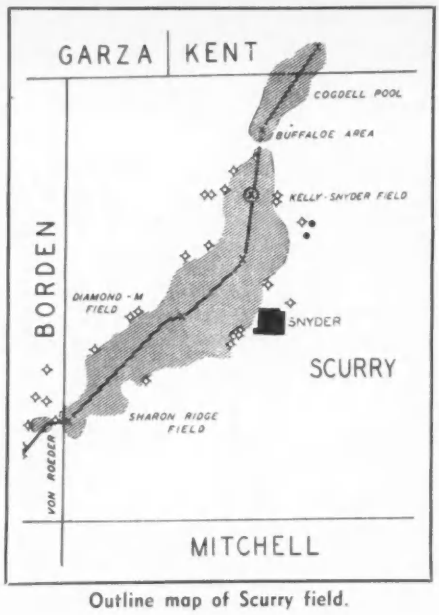
bubble point northward. Initial reservoir pressure was 3122 psi gauge at 4300 feet subsea, a datum of 206 feet above water table. By single-stage atmospheric flash liberation, the produced gas-oil ratio is measured at 944 to 1168 cubic feet per barrel. The corresponding formation volume factor is between 1.57 to 1.69 barrels of reservoir oil per barrel of stock tank oil. Compressibility of the reservoir oil is such that nearly 2 percent of the oil is displaced to effect a reduction of the pressure from the original value to the bubble point. As of January 1, 1951, a typical value for reservoir pressure was approximately 2300 psi, indicating that all oil produced to date could be accounted for by oil expansion. Because of the absence of free gas within the reservoir and the lack of influence from water drive, reservoir pressure has declined in proportion to the withdrawals.

Because of the size and importance of the reservoir, the decline in pressure has given considerable concern to the operators. At hearings on Kelly-Snyder and Diamond "M" before the Texas Railroad Commission, expert engineering testimony showed that the amount of pressure decline per barrel of production would be 12 times as great during the oil expansion period as during the period of production below the bubble point. Operators, however, have taken unusual steps to obtain reservoir information, which is required for determining the advisability of pressure maintenance. Lion Oil, principal operator in the Diamond "M" area, with the approval of the Texas Railroad Commission, instituted pilot water injection in its Strom 18, in Sect. 199, Block 97. Water produced from the Ellenberger formation in another well is injected into the Canyon Reef limestone at a point near the water table. Water injection was started December, 1950, and has been continued at the rate of 2000 barrels per day, with surface injection pressure of 2000 psi.

The reef formation was determined suitable for recovery by water displacement by laboratory experiments, which showed that approximately 50 percent of the oil in place could be removed by water drive, with a range from 8.8 to 76.2 percent recovery. These displacement tests were made through porous plates made wet with the fluid being displaced. Other tests were made without plates. The 12 samples used were obtained from a well in the Kelly-Snyder field, and ranged in permeability from 0.5 to 203 millidarcys and in porosity from 5.8 to 19.0 percent. Connate water estimated from capillary pressure tests with the same samples range from 6.8 to 35.8 percent of the pore space.



Outline map of Scurry field.

Using additional cores of the reef formation and samples of fluids, extensive research pertaining to different methods of oil recovery is being directed in a number of laboratories. There are 86 operators in the four areas of the pool. Operators of nearly all the wells have organized several committees, primarily for engineering purposes. The first organized, the Scurry County Area Engineering Committee, compiles the factual data on pressures, production, and development in the four areas. The data include more than 4000 bottom-hole pressure tests and 10,000 core analyses, as well as routine measurements of oil, gas, and water produced.

Disposition of Gas

All gas produced in the field is to be connected to gasoline plants, the first one being already completed and in operation. All available gas is being sold to two major purchasers. In the gas purchase contracts, the gas purchasers have agreed with the operators to withhold their call on any gas which may be required for lease use and pressure maintenance.

Constructive action toward efficient methods of oil recovery in Scurry County has been taken by the Railroad Commission of Texas in its hearings and orders. As a result of a nearly unanimous favorable response to a questionnaire on conservation, the Scurry Area Canyon Reef Operators Committee was formed in January, 1951, to finance engineering and research studies to obtain data for evaluating every known type of pressure maintenance. A majority of the working interest ownership has approved in principle an agreement for unitization of the entire pool. Through their engineering committee, the operators were preparing a base map of the area to serve for computation of participation factors for the various tracts which are to be pooled. The operators were also securing a water supply which will be available for pressure maintenance by water injection. There are 86 operators in the four producing areas. If the operators find that pressure maintenance is desirable and feasible, the need for an unusually large pressure maintenance operation is indicated.

Gas for injection purposes will be obtained from the area proper as well as from outside sources. All gas now being produced with the oil will be processed through natural gasoline plants for removal of liquid components, and sales contracts for this gas provide that the residue gas may be used for pressure maintenance instead of being sold to pipe lines.

The plant of Standard Oil Company of Texas and the Snyder plant of Sunray Oil Corporation and associates are now in operation and Lion Oil will complete its plant by the end of the year. By January, 1952, all these plants and their gas-gathering systems will be in operation, and gas injection could be commenced on a large scale if unitization is effected.

Sufficient water for a project of this magnitude posed a problem, but this has been solved. In the southwest corner of Scurry County, the Colorado River Municipal Water District is building a dam and storage reservoir and is planning a 21-inch pipe line to the town of Snyder, passing near the edge of the oil-producing area.

If the pool were operated as a unit, with successful pressure maintenance, as much more oil would be recovered and made available as if a new pool of equal size were discovered and produced by primary methods.

REFERENCE

[1] Carl B. Richardson, "Regional Discussion of Pennsylvanian Reefs of Texas," Tulsa Geological Society Digest (1950), XVIII, 74-75.

ACKNOWLEDGMENT

Thanks to William L. Horner, Sunray Oil Corporation, Tulsa, and the Texas Research Committee, for permission to publish data in accompanying article based on "Progress Report on the Reef Pool of Scurry County, Texas," presented before the Secondary Recovery Conference, College Station, Texas. A similar paper was presented before the AIME, February 17, 1951, at St. Louis.

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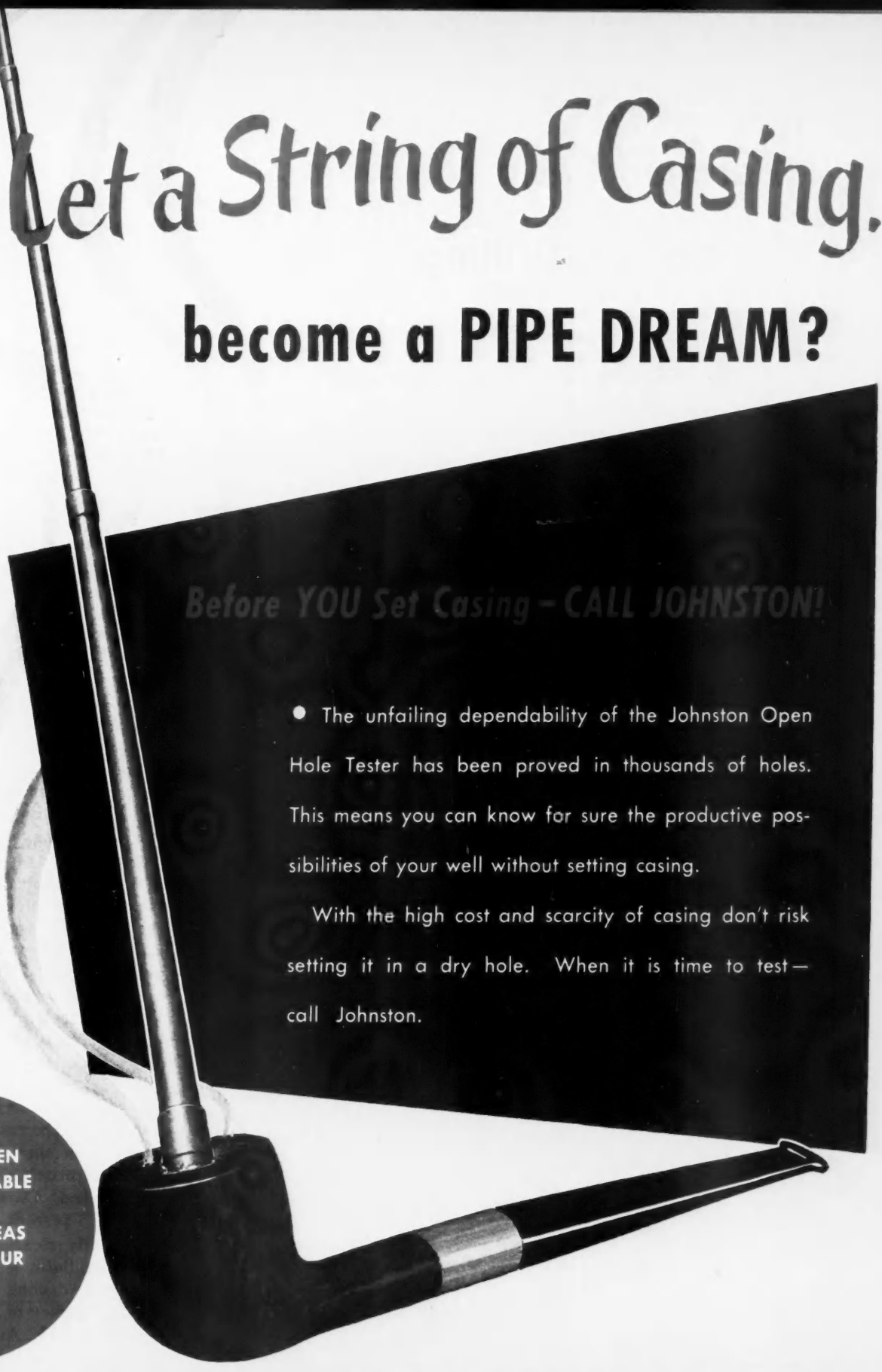

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FORMATION AND CASING TESTING — JOHNSTON

Permian Basin Maintains Position as Drilling Leader

By CECIL W. SMITH, WORLD OIL Staff

THE vast Permian Basin of West Texas and Southeast New Mexico continues to hold a dominant position in U. S. drilling operations. For the second consecutive year, this region has had more drilling activity than any single state except Texas. This activity included number of wells completed, total amount of footage drilled, and number of rigs actively engaged in drilling wells. By mid-1951, the Permian Basin had increased its share in the national drilling total over that held at the same point a year earlier.

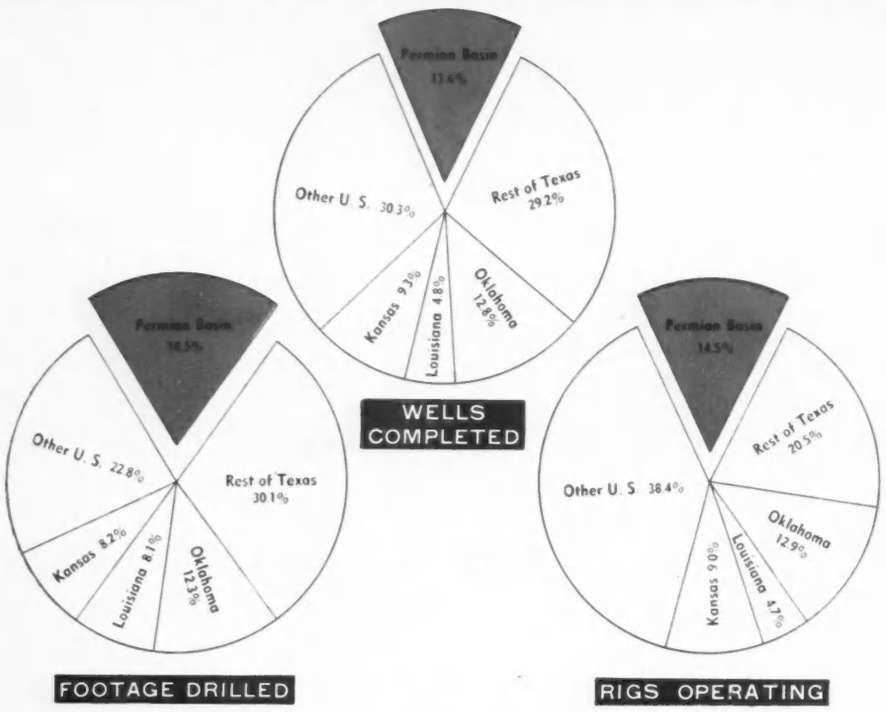
During the first six months of this year, well completions totaled 2821 in the Permian Basin for a gain of 5.9 percent over the 2665 drilled in the same period of 1950. Current activity amounted to 13.6 percent of total U. S. wells, while last year's accounted for 13.2 percent. The rise in drilling importance of the Permian Basin is clearly reflected by the fact that in 1949 and 1948 its wells accounted for only 9.7 and 9.8 percent of the U. S. total, respectively.

The Basin's 13.6 percent of all wells were almost one-half as many as drilled in all the rest of Texas, where wells amounted to 29.2 percent of the nation's total. The state, other than Texas, that came nearest to matching the Permian Basin's drilling record was Oklahoma, where 12.8 percent of the nation's wells were drilled.

An even more prominent position is enjoyed by the Permian Basin when the amount of footage drilled is considered. During the first half of this year, a total of 14,818,056 feet of hole was drilled to account for 18.5 percent of all U. S. cuttings. A year earlier, 13,991,418 feet, or almost 1 million feet less than that drilled so far this year, amounted to a slightly higher 18.9 percent of the nation's total. As in the case of wells, no other state, with the exclusion of Texas, could approach the amount of footage drilled. Oklahoma was closest with 12.3 percent of the grand total.

A fairly clear indication that the Permian Basin is to continue as the dominant drilling area for some time, is the number of active drilling rigs in the region. At the end of June, 1951, there were 692 rigs running in the Basin as compared with a slightly higher 722 so occupied a year earlier. Two years before the total had been no more than 520 rigs. The latest rig total amounted to 14.5 percent of all active U. S. rigs, while last year's added up to 15.2 percent.

PERMIAN BASIN DRILLING OPERATIONS



	NEW WELLS COMPLETED		FOOTAGE DRILLED		RIGS RUNNING ON JUNE 30	
	No.	% of U.S. Total	Amount	% of U.S. Total	No.	% of U.S. Total
TOTAL PERMIAN BASIN:						
(West Texas and Southeast New Mexico):						
First Half 1951	2,821	13.6	14,818,056	18.5	692	14.5
First Half 1950	2,665	13.3	13,991,418	18.9	....	....
Year 1950	5,596	13.0	29,369,191	18.4	722	15.2
Year 1949	3,768	9.7	18,614,504	13.4	520	12.7
Year 1948	3,886	9.8	18,210,688	13.3	663	13.0
WEST TEXAS—(Districts 7-C and 8):						
First Half 1951	2,583	12.4	13,590,511	17.0	589	12.4
First Half 1950	2,379	11.9	12,691,403	17.1	....	....
Year 1950	5,054	11.7	26,894,552	16.9	619	13.0
Year 1949	3,284	8.4	16,417,982	11.8	427	10.4
Year 1948	3,317	8.4	15,764,298	11.5	554	10.9
SOUTHEAST NEW MEXICO:						
First Half 1951	238	1.2	1,227,545	1.5	103	2.1
First Half 1950	286	1.4	1,300,015	1.8	....	....
Year 1950	542	1.3	2,474,639	1.5	103	.2
Year 1949	484	1.3	2,196,522	1.6	93	2.3
Year 1948	569	1.4	2,446,390	1.8	109	2.1

Permian Basin Yields Fifth of U. S. Oil Production

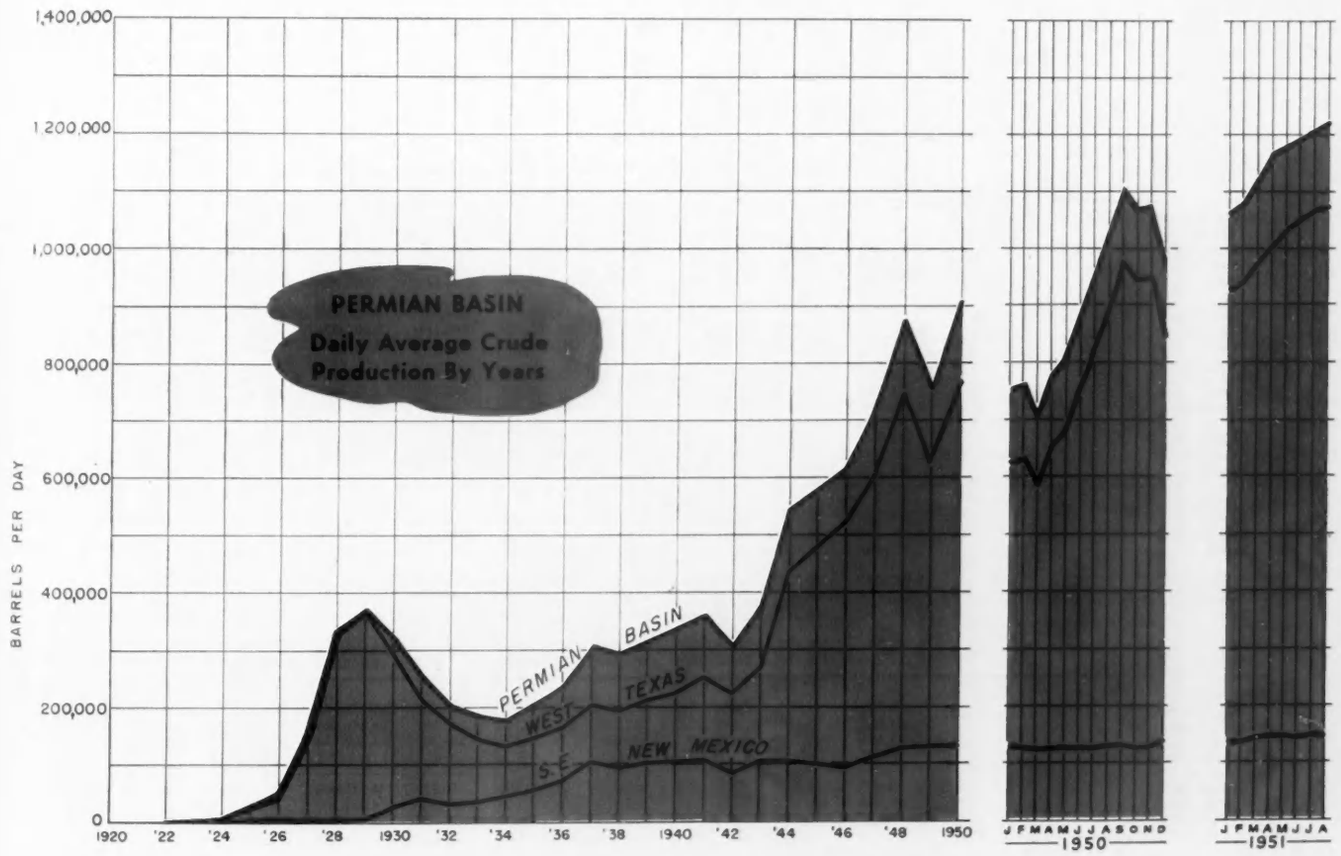
By L. J. LOGAN,
WORLD OIL Staff

SINCE mid-1951 the Permian Basin of West Texas and Southeast New Mexico has been producing crude at an average rate exceeding 1,200,000 barrels per day, the highest output in the history of the region. This represented practically one-fifth of U. S. crude production. West Texas alone averaged approximately 1,064,000 barrels daily in July and Southeast New Mexico 145,000 daily, and both districts were due to show slight increases in August.

The Permian Basin is producing more crude than any nation in the world except the U. S., which yields a total of about 6,200,000 barrels daily, and Venezuela, now producing about 1,700,000 daily. Russia, largest foreign producing country after Venezuela, is believed to be producing around 800,000 barrels daily. Iran was producing about 700,000 daily before nationalization of its industry, and Saudi Arabia is exceeding 600,000 daily. The whole Middle East has been producing around 1,900,000 barrels daily, or about 200,000 a day more than Venezuela. The Permian Basin output of more than 1,200,000 barrels per day substantially exceeds the current production of about 1 million barrels per day in Europe and Africa, including Russia and Russian satellites. In fact, West Texas alone outproduces Europe and Africa.

PERMIAN BASIN crude production has continued its sharp climb and currently is at its all time peak of nearly 1¼ million barrels per day. This is more production than that of any state of the U. S. except Texas. It is more than the output of any nation except the U. S. and Venezuela. The West Texas portion of the Permian Basin currently is producing approximately 1,075,000 barrels daily and southeast New Mexico about 145,000 daily.

Current production of 1,200,000 barrels daily in the Permian Basin is



greater than that of any state in the U. S. except Texas, which averaged 2,783,000 barrels daily in July. Even West Texas alone, with its 1,064,000 barrels daily in July, produced more than any state except Texas. California, largest producing state after Texas, averaged about 978,000 barrels per day in July. That amount was almost equaled by the District 8 portion of West Texas, with output of 957,000 barrels daily in July.

Total Permian Basin production of approximately 1,210,000 barrels per day in July constituted almost one-fifth of the nation's output, having been 19.6 percent of the U. S. total of 6,178,000 barrels daily.

The 1,200,000 barrels per day of current Permian Basin production is more than the combined output of several prominent producing states, as follows: Oklahoma, Kansas, Arkansas, Mississippi, and Wyoming.

Crude production in Texas in July averaged about 2,783,000 barrels per day. Of this total, West Texas accounted for 1,064,000 barrels or more than 38 percent. Texas Railroad Commission District 8 averaged about 957,000 barrels daily and District 7-C about 107,000 daily.

As shown in the table and chart

Crude Oil Production in West Texas and Southeast New Mexico, by Years and Recently by Months

Sources: Texas, 1921-1938, private sources; 1939-May, 1951, Texas Railroad Commission; June-July, 1951, A.P.I.; Aug., 1951, estimated by World Oil . . . New Mexico, 1924-1946, private sources; 1947-1948, New Mexico Oil Conservation Commission; 1949-May, 1951, U. S. Bureau of Mines; June-July, 1951, A.P.I.; Aug., 1951, estimated by World Oil.

(BARRELS)

	Dist. 7-C, Texas		Dist. 8, Texas		Total West Texas		S. E. New Mexico		Total Permian Basin	
	Total	Daily	Total	Daily	Total	Daily	Total	Daily	Total	Daily
Data by Years, 1921-1951:										
1921			*	*	*	*			*	*
1922			34,010	93	34,010	93			34,010	93
1923	18,425	51	166,145	455	184,570	506			184,570	506
1924	1,078,790	2,947	461,105	1,260	1,539,895	4,207	40,000	109	1,579,895	4,316
1925	8,984,865	24,616	798,895	2,189	9,783,760	26,805	797,859	2,186	10,581,619	28,991
1926	13,477,388	36,924	1,847,856	5,063	15,325,244	41,987	1,097,373	3,006	16,422,617	44,993
1927	17,173,218	47,050	35,273,808	96,640	52,447,026	143,690	632,624	1,733	53,079,650	145,423
1928	12,548,740	34,286	106,867,081	291,987	119,415,821	326,273	709,643	1,939	120,125,464	328,212
1929	10,923,491	29,927	122,355,067	335,220	133,278,558	365,147	1,351,666	3,703	134,630,224	368,850
1930	10,825,044	29,658	97,357,620	266,733	108,182,664	296,391	9,924,331	27,190	118,106,995	323,581
1931	12,173,798	33,353	65,405,130	179,192	77,578,928	212,545	14,750,831	40,413	92,329,759	252,958
1932	10,810,858	29,538	52,274,804	142,827	63,085,662	172,365	11,911,538	32,545	74,997,200	204,910
1933	8,563,843	23,463	45,602,515	124,938	54,166,358	148,401	13,630,263	37,343	67,796,621	185,744
1934	6,782,768	18,583	41,669,772	114,164	48,452,540	132,747	16,440,434	45,042	64,892,974	177,789
1935	6,385,155	17,494	47,625,706	130,481	54,010,861	147,975	19,843,843	54,367	73,854,704	202,342
1936	6,831,500	18,665	53,743,224	146,840	60,574,724	165,505	26,422,595	72,193	86,997,319	237,698
1937	8,374,000	22,942	66,346,000	181,770	74,720,000	204,712	37,968,000	104,022	112,688,000	308,734
1938	8,728,425	23,914	62,677,493	171,719	71,405,918	195,633	35,175,892	96,372	106,581,810	292,005
1939	7,593,250	20,803	70,516,417	193,196	78,109,667	213,999	36,971,183	101,291	115,080,850	315,290
1940	6,837,083	18,680	76,889,195	210,080	83,726,278	228,760	38,574,827	105,396	122,301,105	334,156
1941	6,465,337	17,713	85,989,625	235,588	92,454,962	253,301	39,263,953	107,572	131,718,915	360,873
1942	6,173,779	16,914	75,012,443	205,514	81,186,222	222,428	31,568,860	86,490	112,755,082	308,918
1943	6,521,526	17,867	91,574,233	250,888	98,095,759	268,755	38,487,893	105,446	136,583,652	374,201
1944	7,228,370	19,750	152,874,320	417,689	160,102,690	437,439	39,068,737	106,745	199,171,427	544,184
1945	8,394,014	22,997	167,012,036	457,567	175,406,050	480,564	36,857,998	100,981	212,264,048	581,545
1946	10,075,235	27,603	180,813,239	495,379	190,888,474	522,982	35,282,263	96,664	226,170,737	619,646
1947	13,906,004	38,099	206,514,967	565,794	220,420,971	603,893	40,521,243	111,017	260,942,214	714,910
1948	16,668,257	45,542	259,453,586	708,889	276,121,843	754,431	47,235,804	129,060	323,357,647	883,491
1949	16,807,896	46,049	210,767,351	577,445	227,575,247	623,494	47,310,000	129,616	274,885,247	753,110
1950	20,917,096	57,307	262,985,846	720,509	283,902,942	777,816	47,434,000	129,956	331,336,942	907,772
Total Thru 1950	271,268,155		2,640,909,489		2,912,177,644		669,273,653		3,581,451,297	
1951: 1st 8 Months	22,641,852	93,176	222,866,314	917,145	245,508,166	1,010,322	34,448,200	141,762	279,956,366	1,152,084
Total Thru August, 1951	293,910,007		2,863,775,803		3,157,685,810		703,721,853		3,861,407,663	
Data by Months, 1950-1951:										
1950—										
January	1,388,658	44,795	17,882,179	576,845	19,270,837	621,640	4,030,000	130,000	23,300,837	751,640
February	1,325,160	47,327	16,379,956	584,999	17,705,116	632,326	3,597,000	128,464	21,302,116	760,790
March	1,368,373	44,141	16,688,394	538,335	18,056,767	582,476	3,845,000	124,032	21,901,767	706,508
April	1,438,476	47,949	18,109,622	603,654	19,548,098	651,603	3,709,000	123,633	23,257,098	775,236
May	1,560,768	50,347	19,605,150	632,424	21,165,918	682,771	3,992,000	128,774	25,157,918	811,545
June	1,643,406	54,780	20,937,974	697,932	22,581,380	752,712	3,858,000	128,600	26,439,380	881,312
July	1,795,498	57,919	23,488,364	757,689	25,283,862	815,608	4,013,000	129,452	29,296,862	945,060
August	1,924,758	62,089	25,625,918	826,642	27,550,676	888,731	4,126,000	133,097	31,676,676	1,021,828
September	2,022,842	67,428	27,105,093	903,503	29,127,935	970,931	4,032,000	134,400	33,159,935	1,105,331
October	2,147,808	69,284	26,977,317	870,236	29,125,125	939,520	4,106,000	132,452	33,231,125	1,071,972
November	2,136,699	71,223	26,200,255	873,342	28,336,954	944,565	3,952,000	131,733	32,288,954	1,076,298
December	2,164,650	69,827	23,985,624	773,730	26,150,274	843,557	4,174,000	134,645	30,324,274	978,202
1951—										
January	2,366,782	76,348	26,250,782	846,799	28,617,564	923,147	4,188,000	135,097	32,805,564	1,058,244
February	2,197,169	78,470	24,077,051	859,895	26,274,220	938,365	3,828,000	136,714	30,102,220	1,075,079
March	2,617,455	84,434	27,739,647	894,827	30,357,102	979,261	4,379,000	141,258	34,736,102	1,120,519
April	2,691,667	89,722	27,900,413	930,014	30,592,080	1,019,736	4,303,000	143,433	34,895,080	1,163,169
May	2,935,779	94,702	29,101,521	938,759	32,037,300	1,033,461	4,458,000	143,807	36,495,300	1,177,268
June	3,158,150	105,272	28,258,300	941,943	31,416,450	1,047,215	4,255,700	141,857	35,672,150	1,189,072
July	3,312,900	106,868	29,680,950	957,450	32,993,850	1,064,318	4,504,300	145,300	37,498,150	1,209,618
August	3,361,950	108,450	29,857,650	963,150	33,219,600	1,071,600	4,532,200	146,200	37,751,800	1,217,800
Comparisons, 1950-1951:										
1st 8 Months, 1950	12,000,714	49,386	154,525,177	635,906	166,525,891	685,292	31,170,000	128,271	197,695,891	813,563
1st 8 Months, 1951	22,641,852	93,176	222,866,314	917,145	245,508,166	1,010,322	34,448,200	141,762	279,956,366	1,152,084
Difference	+10,641,138	+43,790	+68,341,137	+281,239	+78,982,275	+325,030	+3,603,230	+13,491	+82,260,475	+338,521
Percent Difference	+88.7	+88.7	+44.2	+44.2	+47.4	+47.4	+10.5	+10.5	+41.6	+41.6
August, 1950	2,128,427	68,659	27,351,755	882,314	29,480,182	950,973	4,126,000	133,097	33,606,182	1,084,070
August, 1951	3,361,950	108,450	29,857,650	963,150	33,219,600	1,071,600	4,532,200	146,200	37,751,800	1,217,800
Difference	+1,233,523	+39,791	+2,505,895	+80,836	+3,739,418	+120,627	+406,200	+13,103	+4,145,618	+133,730
Percent Difference	+58.0	+58.0	+9.2	+9.2	+12.7	+12.7	+9.8	+9.8	+12.3	+12.3

* Small Production, but no Record Available.

herewith, the Permian Basin has had its most noteworthy development and expansion during the past nine years, 1943-1951, the World War II and postwar years. In these golden years, production has increased four-fold, to 1,200,000 barrels daily from 300,000 a day in 1942, and output is now at the highest level in the history of the region, coming from more different producing areas (over 300) and more different producing formations than ever before.

In the preceding 15 years, 1928-1942, the region was a well established, dependable source of oil, mostly high sulfur content or sour crude, with production varying from 200,000 to 350,000 barrels daily in response to changing economic conditions and oil industry developments, but averaging about 300,000 daily. That was the period of flush production from shallow, Permian production, before output was augmented by additional, deeper formations, including those yielding higher gravity, sweet crude.

Previously, in the eight years, 1920-1927, Permian Basin production had been comparatively small, although that period covered the several important oil discoveries on which subsequent large production was based. Earliest production was established in October, 1920, in Mitchell County, through rank wildcatting considerably west of Ranger and other fields of West Central Texas. But the production, from shallow (2500-foot) Upper Clear Fork (Permian) pay, in what became the Westbrook field, was small and attracted very little notice, until followed by discovery of a better, Middle Clear Fork (2800-3225-foot) pay some months later, in April, 1921. The Westbrook field established the first commercial oil production in the Permian Basin, although this production was not especially attractive, as evidenced by the fact there was no appreciable development in the field until 1924.

The Big Lake (Shallow) field, Reagan County, discovered May 28, 1923, by a well completed in the San Andres lime (Permian) at about 3000 feet, furnished the first sustained prolific production in the Permian Basin. It was the Big Lake discovery that caused construction of the area's first pipe line outlet and led to widespread prospecting.

In 1925 and 1926 several prolific fields were discovered, including Yates, Hendrick, McCamey, Todd, McElroy, and others yielding sour crude from Permian zones. These fields then were developed and pipe lines were built, and during 1927 the Permian Basin was transformed from a minor to a major producing area. At the beginning of 1927, the region was producing only about 65,000 barrels per day, but at the close of the year it was producing approximately 275,000 daily, with output held to that level only through voluntary proration.

Cumulative production in the Permian Basin will reach approximately 4 billion barrels by the end of this year. It stood at 3,581,451,297 barrels at the end of 1950 and increased about 279,956,366 barrels in the first eight months of 1951, reaching 3,861,407,663 barrels as of September 1, 1951. The latter figure included 3,157,685,810 barrels in West Texas and 703,721,853 barrels in southeast New Mexico.

U. S. May Produce 8 Million Barrels Daily by 1955

By ROBERT E. SPANN, WORLD OIL Staff

FORECASTS using several different methods of calculation, including a new "productivity trend" analysis developed by the Petroleum Administration for Defense, indicate crude oil productivity capacity in the U. S. can be increased from an average of approximately 6.8 million barrels daily in 1951 to nearly 8 million barrels a day in 1955. This assumes that about 43,400 wells (PAD's 1951 program) will be completed annually during the next five years.

Comparisons of estimated productive capacity were drawn in an overall analysis of forecasts undertaken by PAD's production division in an effort to evaluate the reliability of various calculation methods. The study compared a forecast made by PAD last March based on estimates of petroleum regulatory agencies in oil-producing states and data obtained from the Committee on Oil and Gas Availability of the National Petroleum Council; a forecast made by PAD on the basis of the newly developed "productivity trend" analysis; the July, 1951, forecast of NPC; and a PAD forecast based on the relationship between productive capacity and annual additions to domestic petroleum reserves.

The relatively small differences in the various forecasts shown in the accompanying table were described by Deputy Petroleum Administrator Bruce K. Brown as remarkable. Because of the narrow range between the various estimates Brown said the PAD would be on "solid ground" in using these forecasts in its mobilization planning.

PAD's "productivity trend" method of forecasting was explained as resting on the assumption "that established historical trends in discovery and development of oil fields can be projected at least a few years into the future with confidence." Simply stated, the method works as follows:

- The decline in productive capacity of wells producing at the beginning of a given year is estimated for that year, for example 1950.
- This decline is then subtracted from the actual productive capacity at the end of the preceding year, 1949, to determine the estimated capacity of the old wells at the end of the year 1950.
- This figure in turn is subtracted from the actual productive capacity at the end of 1950.
- The result is a calculation of the contribution to productive capacity of the new wells completed in 1950.

Calculations of the productive capacity for the years back to 1943 have been made by this method to establish the trend in productive capacity. This trend has then been projected forward to give the forecast.

Summary of Forecasts of U. S. Crude Productive Capacity

FORECAST*	AVERAGE PRODUCTIVE CAPACITY PRE-YEAR (Thousands Barrels Daily)				
	1951	1952	1953	1954	1955
PAD Estimate March, 1951	6,879	7,161	7,375	7,510	7,613
PAD Productivity Trend Analysis	6,830	7,140	7,415	7,645	7,845
Estimated from Crude Oil Reserve Trend	6,790	7,055	7,300	7,530	7,752
Liquid Hydrocarbon Reserve Trend Analysis	6,800	7,100	7,400	7,698	7,997
National Petroleum Council Committee, July, 1951:					
Upper Range	6,988	7,333	7,624	7,854	8,053
Lower Range	6,842	6,976	7,065	7,105	7,114

* Assuming approximately 43,400 completions annually.

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Descriptions, sizes, weights and specifications of various steels normally carried in stock are included in the new "Steel Stock List and Reference Book" by Earle M. Jorgensen Company. Included also are technical and metallurgical data for selecting the right steel for the job.

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Diamond Coring

A comprehensive cost analysis of diamond coring on the cost-per-foot-cut plan of Core Laboratories, Inc., is included in a new report.

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"Shorty" blocks in 65, 125 and 200-ton sizes are described in a new bulletin by IDECO, a division of Dresser Equipment Company. The blocks are equipped with the new "Fabriform" sheaves.

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Rubber Lined Joints

A new catalog and engineering manual issued by Gates Engineering Company illustrates the GACO Rubber-Lined Pipe Joint system. The joints may be installed in the field.

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Reciprocating Pump

The six-inch stroke direct flow pump series made by The Aldrich Pump Company is described in a new two-color, eight-page bulletin which gives full details of design and construction, including dimension and sectional drawings, performance data and pump specifications.

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Business Anniversary

The Louis Allis Company, which is celebrating its 50th business anniversary, has issued a special edition of the Louis Allis Messenger to mark the occasion. Entitled "50 Years of Progress," the book gives a history of the development of the firm, and describes the electrical products it makes.

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Chart drives and accessories for recording meters and instruments are described in a new Rockwell Manufacturing Company bulletin.

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Testing Services

A two-color folder describes inspection and testing services offered by Shilstone Testing Laboratory, Inc.

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Cathodic Protection Guide

A new slide-rule available from Federated Metals Division, American Smelting and Refining Company, is designed to assist those engaged in cathodic protection of pipe lines. It gives required magnesium anode size and life, length of pipe protected, and current output when pipe size and coil resistivity are known.

Circle No. 9 on Postcard

Wire Rope Uses

Wire rope applications in many industries are discussed in a new American Steel & Wire Company recommendation book, "The Right Rope for the Job." The illustrated, two-color book contains 40 pages of information, including a section on the use of wire rope in the oil industry.

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Safety Equipment Care

Proper use and care of safety equipment in the cleaning of lease production tanks is the subject of a new 10-page pamphlet published by Davis Emergency Equipment Company.

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Threaded Surface Casing

An illustrated bulletin available from Naylor Pipe Company on threaded surface casing includes structural and performance data as well as complete specifications.

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Steam Use

Questions and answers on the economical use of steam are contained in a new booklet, "How Increasing Your Steam Costs Can Save Money," by Sarco Company, Inc.

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Gas Turbine

A new two-color booklet on General Electric Company's gas turbine for pipe line pumping describes application and operation of the equipment. The booklet is liberally illustrated and contains a breakdown chart showing components of the turbine.

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(More Literature News on Page 120.)

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A8	B8	C8	D8	E8	F8	G8	H8	J8	K8	L8	M8	N8	P8	Q8	R8	S8	T8	U8	V8	X8
A9	B9	C9	D9	E9	F9	G9	H9	J9	K9	L9	M9	N9	P9	Q9	R9	S9	T9	U9	V9	X9
A10	B10	C10	D10	E10	F10	G10	H10	J10	K10	L10	M10	N10	P10	Q10	R10	S10	T10	U10	V10	X10
A11	B11	C11	D11	E11	F11	G11	H11	J11	K11	L11	M11	N11	P11	Q11	R11	S11	T11	U11	V11	X11
A12	B12	C12	D12	E12	F12	G12	H12	J12	K12	L12	M12	N12	P12	Q12	R12	S12	T12	U12	V12	X12
A13	B13	C13	D13	E13	F13	G13	H13	J13	K13	L13	M13	N13	P13	Q13	R13	S13	T13	U13	V13	X13
A14	B14	C14	D14	E14	F14	G14	H14	J14	K14	L14	M14	N14	P14	Q14	R14	S14	T14	U14	V14	X14
A15	B15	C15	D15	E15	F15	G15	H15	J15	K15	L15	M15	N15	P15	Q15	R15	S15	T15	U15	V15	X15

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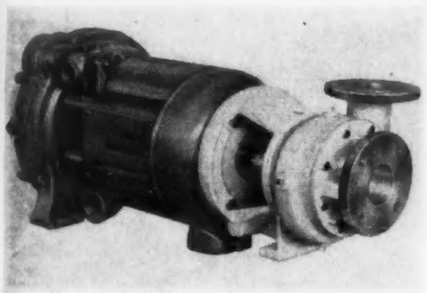
NEW AND IMPROVED EQUIPMENT

SUPPLEMENTING COMPOSITE CATALOG

KEEP INFORMED by requesting additional information on new equipment and services described on this and following pages. SAVE TIME by using one of the free and convenient Reader Service Postcards on opposite page. Circle number on card corresponding to the number listed at the end of each new equipment item on which you desire additional information.

Turbine Driven Pump

This item supplements Byron Jackson Company data on pages 937-1036 of Composite Catalog, 18th Edition.



The TL Bilton pump is now available to steam power users with a new steam turbine driven model made by Byron Jackson Company. It is a combination of standard TL Bilton pump sizes with one of two Moon steam turbines. The two steam turbine sizes used both have the same shaft extension and rabbitt fit so that one standard TL Bilton connector and shaft sleeve is used with all pump and turbine combinations. Sizes of pumps are from 1¼ to 3 inches, and capacities range up to 600 gallons per minute.

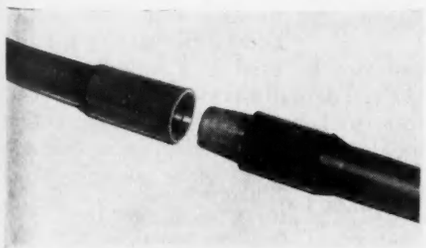
Circle No. 15 on Postcard

•

Drill Pipe

This item supplements The National Supply Company data on pages 3501-3632 of Composite Catalog, 18th Edition.

A welded connection is employed between the tool joint and the upset ends of Spangweld drill pipe, a new product of Spang-Chalfant division of The National Supply Company. The pipe is available in every type and size of joint in common use, and also different combinations of joint and pipe o.d.'s that cannot otherwise be furnished when screwed connections are used. Hard-faced tool joints are optional. Hard-facing material is inlaid by automatic welding equipment in six bands. Three pads spaced 120 degrees apart around the 18-degree taper of the elevator shoulder are also provided.



Circle No. 16 on Postcard

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Pipe Coating

This item supplements Tube-Kote, Inc., data on page 4913 of Composite Catalog, 18th Edition.

A new pipe coating made by Tube-Kote, Inc., is a rubbery copolymer baked-on plastic. TK-43 is applied to the metal surface in multiple coats to produce a smooth, tough film thickness up to 30 mils, and is especially adaptable to sucker rods and tubing in pumping wells. The coating is inert to most corrosive chemicals at normal temperature. It has low absorption and low vapor-transmission rates. It is dense, having high molecular weight with resin particles thoroughly fused together during the baking process.

Circle No. 17 on Postcard

•

Mud Pump Piston

This item supplements Harrisburg Sales & Service, Inc., data on pages 2225-2230 of Composite Catalog, 18th Edition.

A new mud pump piston developed by Harrisburg Sales & Service, Inc., has a replaceable, cup type rubber with positive seal and clean wiping action. The steel inner body provides rigidity. The piston can be renewed by installing new piston rubbers on the original forged steel hub. They may be replaced at the rig without removing the piston from the rod. The forged alloy steel piston bodies are built to withstand the highest pump pressures and yet are light enough to protect pistons, piston rods, liners and

stuffing box packing from excessive wear.

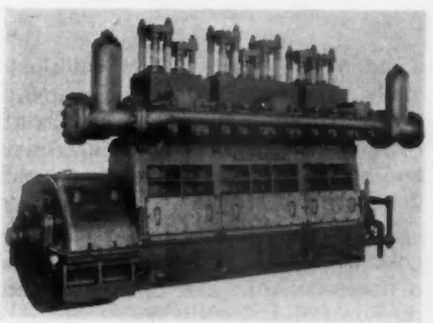
Circle No. 18 on Postcard

•

Direct Flow Pump

This item supplements The Aldrich Pump Company data on pages 164-165 of Composite Catalog, 18th Edition.

A six-inch stroke direct flow pump has been added to the line of pumps made by The Aldrich Pump Company. The new series includes Triplex, Quintuplex, Septuplex (pictured), and Nonuplex units, having 3, 5, 7 and 9 plungers, respectively. Ranging from 300 to 900 horsepower, the pumps operate at crankshaft speeds up to 300 revolutions per minute and are suitable for direct drive by engine or synchronous engine-type motor. The fluid end is sectionalized. All wearing parts are interchangeable with other plunger sizes.



Circle No. 19 on Postcard

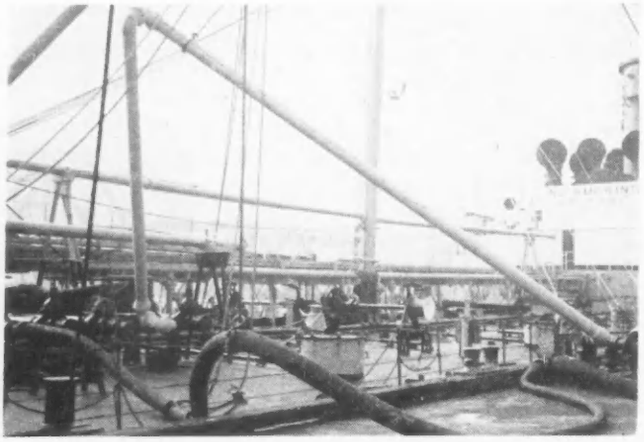
NEW EQUIPMENT

SUPPLEMENTING COMPOSITE CATALOG

To obtain additional information use convenient Reader Service Postcard on page 113. Circle number on card corresponding to the number listed at the end of each equipment item on which more information is wanted.

Aluminum Hose

This item supplements Chiksan Company data on pages 1225-1244 of Composite Catalog, 18th Edition.



Aluminum tubing and swivel joints are being made by Chiksan Company for use as marine and barge hose. In addition to being substantially lighter than rubber or synthetic hose, the aluminum hose is impervious to severe temperature and climatic conditions which damage other types. When not in use, the hose is swung back to the mast without requiring disconnection from the dock riser. All turning or flexing movement is handled by double rows of steel balls in steel races which are inserted in the aluminum body of the swivel joint.

Circle No. 20 on Postcard

•

Flow Interlock

This item supplements General Electric Company data on pages 1901-1920 of Composite Catalog, 18th Edition.

A device which responds to a flow of water to open or close an electrical

contact, an improved flow interlock made by General Electric Company has fine differential, union fittings at both ends, bronze piston, reduced size and weight, simple adjustment, and ample wiring space.

In operation, the device closes a contact when a flow of water exceeds a preset amount and opens it when the flow falls below the preset amount. Working on this principle, it actually acts like a fuse in a circuit which depends upon water cooling for protection.

Only one screw adjustment is needed to set the circuit for any flow from one-half gallon to four gallons per minute. Flow differential between the cut-in and cut-out of the electrical contact is 0.1 gallon maximum. The interlock does not control the amount of water flow; this can be accomplished, however, by installing a throttling or regulating valve ahead of the device.

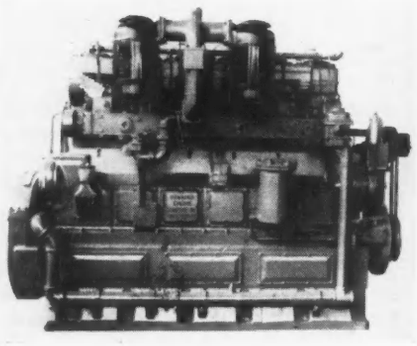
Circle No. 21 on Postcard

•

Natural Gas Engine

This item supplements Cummins Engine Company, Inc., data on pages 1333-1352 of Composite Catalog, 18th Edition.

Natural gas where available can be utilized in a new engine developed by Cummins Engine Company, Inc. The Model LR-600-GAS engine is classified in the medium speed field, because of its 1100 revolutions per minute rating. It is a six-cylinder, spark ignition engine, with a displacement of 2477 cubic inches, a bore and stroke of 7¼ x 10, and maximum rated horsepower of 315hp. It has gas carburetor, mixing valve, magneto, and other special accessories for gas operation. Approximate weight of the engine is 7500 pounds, and it has a compression ratio of 6.8 to 1. Air starting equipment is standard, with a 32-volt electric starting system optional.



Circle No. 22 on Postcard

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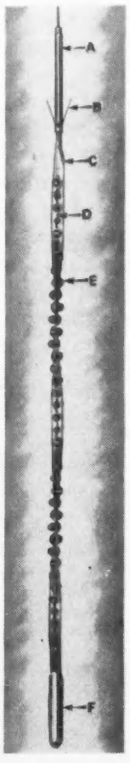
Jet Perforator

This item supplements McCullough Tool Company data on pages 3205-3244 of Composite Catalog, 18th Edition.



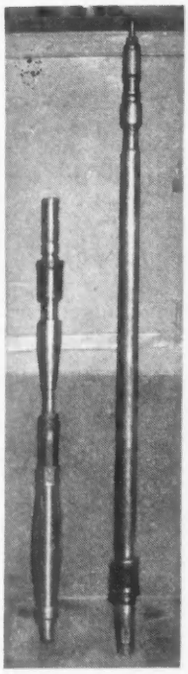
One-third less explosives are required to effect 75.9 percent deeper penetration through solid steel plate with the Flexible Glass Jet Perforator, according to McCullough Tool Company. The smaller explosive requirement makes the tool especially adaptable to use in small pipe where there is the danger of damaging casing. Flexibility of the steel strip carrier permits it to be lowered into the hole below a bad place in the pipe or past a sharp dogleg or kink in the casing. The charges, when used in the steel strip carrier can be set as close to the casing as possible and there is no body to split and stick in the hole. The glass jet units can also be used in a solid steel gun body. Parts illustrated are A, electric rope socket assembly; B, sonic collar locator; C, flexible steel strip carrier; D, primacord; E, glass jet units; and F, sinker bar.

Circle No. 23 on Postcard

OTHER NEW AND IMPROVED EQUIPMENT

KEEP INFORMED by requesting additional information on new equipment and services described on this and following pages. SAVE TIME by using one of the free and convenient Reader Service Postcards on page 113. Circle the number on card corresponding to the number listed at the end of each new equipment item on which more information is wanted.

Tubing Tester



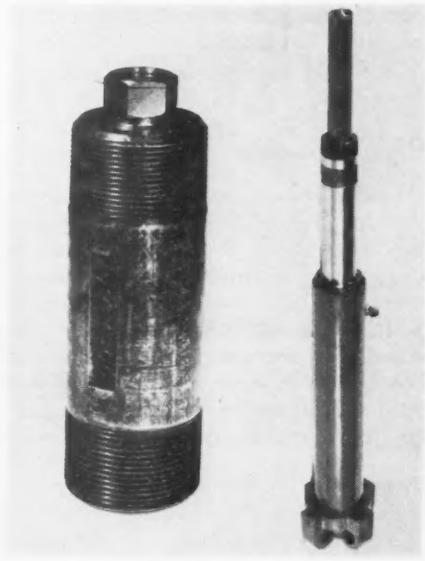
With the "Hydro-Test" retrievable plug method, thread leaks and defective tubing can be tested in the "made up" position by using pressure tests of each stand while tubing is being run in the hole. The tool is a retrievable plug assembly consisting of a top and bottom packer joined by sucker rods. It is lowered into the tubing until the bottom packer is below the made up joint. The area between the packers is filled with water, and test pressure is applied at the top collar for a few seconds. Loss of only a few drops of water will reflect on the pressure gauge. If the stand passes test, the next stand is added to the string and lowered as usual. The tool is then raised to new stand and test made. Subsequently, each stand is tested until full string is run in. If a leak is found at any test, string is raised for inspection and leaks are eliminated by tightening collar or by replacing collar or joint of tubing and another test made. Thus no leaks exist in the completed made up string.

Circle No. 24 on Postcard

•

Plug Seal Nipple

The Cosasco Scotch Nipple, made by Corona Oil Specialties & Service Company, simplifies christmas-tree and well hookups, yet permits removal of control valves at will even when they are under pressure. The assembly consists of the nipple and the gauge carrier plug into which a gauge can be inserted when a pressure reading is desired. The gauge carrier plug is



removable under pressure by installing a round opening valve of proper line pipe thread size. The high pressure lubricator (pictured at right) is then attached to the other side of the valve and by manipulating the lubricator the plug is withdrawn through the valve and the valve closed.

Circle No. 25 on Postcard

•

Measuring Wheel

A measuring wheel exactly four feet in circumference, Model 400

made by Rolatape, Inc., registers distances up to 100,000 feet, then repeats the cycle. It measures and records as it is wheeled over course, does not sway in operation, but tends to stabilize its course and follow a straight line. Model 400 weighs five pounds. It can be operated by the driver of a car as he drives slowly over the course to be measured.

Circle No. 26 on Postcard

•

Coating Material

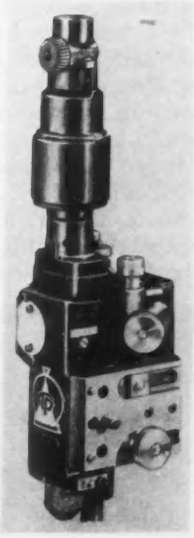
Ampreg E, a new thermosetting synthetic resin impregnant made by The Atlas Mineral Products Company, is specifically for concrete and porous castings. It can be applied by brush or dip coat methods, and forms a room temperature curing effective sealant which is resistant to water, salts, organic solvents, many acids and mild alkalies. It also resists oxidizing materials such as chlorine dioxide and sodium hypochlorite.

Circle No. 27 on Postcard

•

Valve Seat Grinder

A new portable valve seat grinder, especially designed for large internal combustion engines with inside seat diameters from 2-15/16 to 12 inches, is made by Thompson Products, Inc. The unit can be used for grinding both valve seat faces and counterbores within the size range, and regularly holds concentricity to .003 inch. The grinder, which may be used wherever air pressure is available, consists essentially of a grinding unit with controls, a wheel dressing unit and an air motor drive.



Circle No. 28 on Postcard

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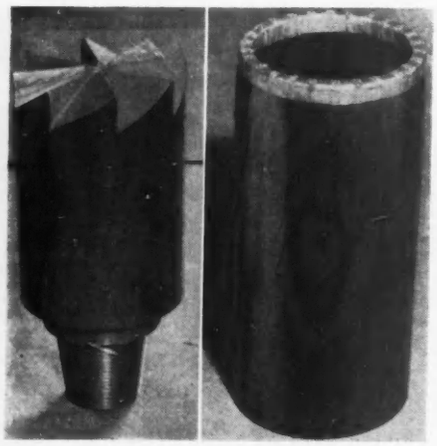
Drilling Tools



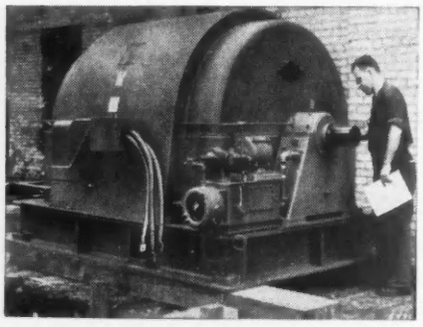
Two new tools are available to West Texas drillers from Brown Well Service. The cone buster mill, pictured at left, disposes of rock bit cones lost in a hole when it is run on the bottom of a full string of drill collars. The tool is made of 6140 heat treated steel, with all cutting edges hard surfaced with tube borium. It is complete with junk basket. The diamond rotary shoe, right, is also available for cleaning up difficult jobs that do not respond to ordinary methods.

Circle No. 29 on Postcard

•

Induction Motors

Giant electric motors and pumps, made by Electric Machinery Manufacturing Company and claimed to be the largest ever built for oil pipe line pumping service, are being installed by Texas Pipe Line Company, Houston, on its Basin Pipe Line System, for an expansion of the 515-mile New Mexico to Oklahoma crude line. Eight 3000-horsepower, 1780 revolutions per minute induction motors will drive centrifugal pumps in four stations of the Jal, N. M., to Cushing, Okla., section of the line. Seven similar 1250-horsepower units will add 100,000 barrels per day to the pumping capacity of the system. The 3000-horsepower motors use pressure-lubricated bearings, and are enclosed for ventilation from a filtered fresh air source to minimize fire hazard.



Circle No. 30 on Postcard

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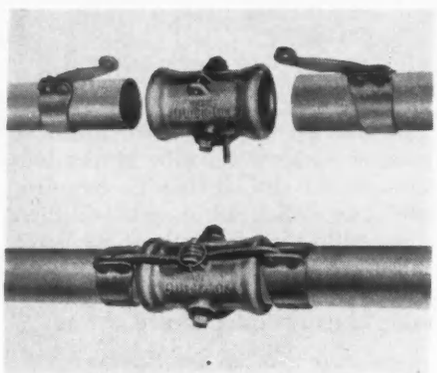
Pipe Coupler

Quick-locking coupler equipment for pipe line construction, the "Quick-Lok" line made by R. M. Wade & Company, is connected and disconnected without tools, by means of a positive manual lock. Outlets are provided for connecting air lines, lateral hoses, etc. Positive sealing is assured by a special rubber or Neoprene gasket. Both self-draining and non-self-draining gaskets are available. The aluminum alloy couplers are tested to handle 300 pounds per square inch pressure.



Circle No. 31 on Postcard

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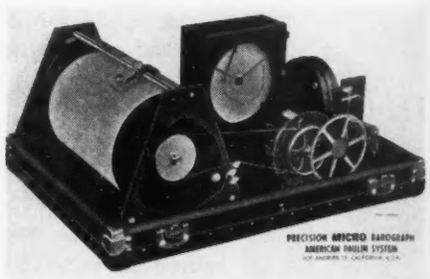
Rust Preventive

Petrobase 210, made by Pennsylvania Refining Company, is a synthetic rust preventive composition which imparts effective rust preventive properties to petroleum oils, petrolatums and waxes. The inherent polar activity of Petrobase 210 causes oils and waxes to displace preferentially water from metal surfaces, and also prevents redeposition of aqueous vapors or liquids on the metal surface. It offers high humidity protection, acidic emulsion or solution displacement and salt water immersion and spray protection, according to the manufacturer.

Circle No. 32 on Postcard

Barograph



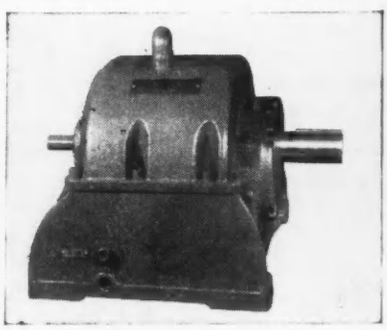
American Paulin System manufactures a new Recording Micro Barograph constructed on the Nul or Zero-Gauging principle, using the same pressure sensitive device incorporated in all of the company's other instruments. All power in the actuating and recording mechanism is supplied by two heavy duty sealed instrument clocks. The instrument records a pressure curve over a range of ± 1 inch mercury and can be used at any elevation from sea level to 10,000 feet. Graphs are supplied which convert readings to the closest one foot elevation where instrument is used as base recorder for altimeter surveys.

Circle No. 33 on Postcard

•

Speed Reducer

New DB double-reduction speed reducers, made by Westinghouse Electric Corporation in ratings from 1 to 100 horsepower, are designed for applications on small to medium-size drives where the prime mover is coupled or belted to the gear unit. The units use all-external helical gearing, arranged on a horizontal plane. When coupled to an electric motor, a straight-line drive results. Eight unit sizes are available. Twelve standard gear ratios range from 6.25 to 58.3:1.



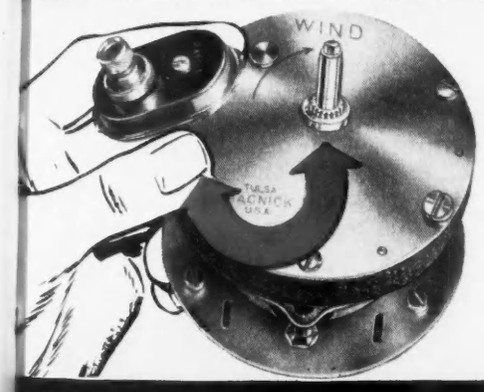
Circle No. 34 on Postcard

Mighty Midgets

SHOWN ACTUAL SIZE

Left to right: Rockwell 24 hour wind and 8 day wind midget mechanical drives with rotation-converting Turret that, on the eight day model, permits one basic drive to be adapted to as many as 11 different speeds.

dependable, convenient drives for Meters, Controls, Recorders



THE TURRET ON TOP

does the trick!

The above illustration shows how Turrets lock onto the chart arbor of the eight day model to change rotation speeds. The eight day drive is basically 24-hour rotation. Turrets are available for chart rotation times of 2, 3 4, 6, 8, 12 and 48 hours; 3, 7 and 8 days.

THE MOST CHART DRIVE IN THE LEAST SPACE

Rockwell Midget Chart Drives fill the need for compact, powerful mechanical drives in instruments where space is at a premium. They are strongly constructed with cases of die cast aluminum, gears mounted in phosphor bronze bearings and an escapement case made of stainless steel and clear plastic. This escapement snaps into place without tools and is readily replaceable.

Rockwell Midgets wind through the chart arbor. They snap into a separate mounting ring only 3¼" in diameter which may be positioned on bosses or adaptors to fit any instrument case.

This combination of small size, versatility of application and precision construction makes Rockwell Midgets the most economical drives to use. It will pay you to specify them in instruments made by any manufacturer.

ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PA.

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ROCKWELL CHART DRIVES

NEW LITERATURE

Copies may be obtained easily and without cost by using Reader Service Postcard. Just circle on the card the number at the end of each item in which you are interested. The convenient Postcards are on page 113.

Plant Protection

A revised training manual, "Plant Protection for National Defense," issued by Detex Watchclock Corporation, includes instructive information to guide watchemen, guards, supervising personnel and management in effective plant and property protection.

Circle No. 35 on Postcard

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Aggregate

Strata-Crete, an aggregate to lighten and give bridging effectiveness to cement slurries, is the subject of Great Lake Carbon Corporation's new ten-page Technical Data Sheet Series booklet. In addition to a technical description of the properties of Strata-Crete, the booklet includes mixing recommendations, typical slurry properties, and complete water tables and compressive strengths.

Circle No. 36 on Postcard

•

Drilling Head

Type "K" drilling head, made by The Guiberson Corporation, is the subject of a new installation-operation-maintenance manual. Engineering data and parts price list are included.

Circle No. 37 on Postcard

•

Company History

The special Centennial Issue of *Taylor Technology*, external house organ of Taylor Instruments Companies, is devoted to the history and business growth of the companies, which this year celebrate their 100th anniversary.

Circle No. 38 on Postcard

•

Magnetic Drive

A 32-page technical book, "Precision Speed Control with the Adjustable Speed Magnetic Drive," issued by Electric Machinery Manufacturing Company, contains information on both the Magnetic Drive and Magnetic Amplifier Regutron Speed Control.

Circle No. 39 on Postcard

Swivel Joints

Three new catalogs describe swivel joints made by Chiksan Company. A 20-page bulletin covers general information on ball-bearing swivel joints; a four-page folder covers dimensions; and another four-page bulletin discusses packing sets for Chiksan swivel joints.

Circle No. 40 on Postcard

•

Pipelaying Costs

A new 12-page booklet, "International Power Lowers the Boom on Pipelaying Costs," published by International Harvester Company, shows the part the company's crawlers play in handling every phase of the pipelaying business.

Circle No. 41 on Postcard

•

Aerial Surveys

A general story on aerial surveying, reprinted from Public Works Magazine, is available from Abrams Aerial Survey Corporation. Uses of aerial photography in surveying and mapping are described.

Circle No. 42 on Postcard

•

Gas Conditioning

A research bulletin on gas conditioning and Blaw-Knox gas equipment contains illustrations, including photomicrographs, showing the effects of entrained wet and dry dusts. Included are description and specifications of the new Electroil Fogger.

Circle No. 43 on Postcard

Need Extra Copies of July 15 Issue?

A limited number of extra copies of The International Operations Issue were printed and may be obtained for $1 a copy. Send your order and remittance to:

WORLD OIL
Department 715
P. O. Box 2608
Houston 1, Texas

Safety Valves

The complete line of tubing and surface safety valves made by Otis Pressure Control, Inc., is covered in a new, eight-page bulletin. Purposes, operating principles and design details of the valves are described, and typical installations are illustrated.

Circle No. 44 on Postcard

•

Brake Service

A brake service manual published by Warner Electric Brake & Clutch Company provides instructions for installation, servicing and trouble-shooting on all Warner electric brakes.

Circle No. 45 on Postcard

•

Flow Meters

Metering flows in crude or products pipe lines is covered in a new four-page bulletin which outlines the operating principles and application of the electric flow meter system of Brown Instruments division, Minneapolis-Honeywell Regulator Company.

Circle No. 46 on Postcard

•

Swivels

A new booklet describes Ideco Model DSS-300, SS-300, SS-250 and SS-150 streamlined swivels and floating washpipe assemblies, and presents construction details, specifications, and one page of photos.

Circle No. 47 on Postcard

•

Castings

The Colmonoy process of hard facing castings is described in a new folder available from Diamonds and Tools, Inc. The alloys can be adapted to resist different types of wear, such as abrasion, corrosion, impact, etc.

Circle No. 48 on Postcard

•

Separators and Tanks

National Tank Company has issued amended data sheets to replace or supplement material in its General Price Book. The new information applies to horizontal separators and welded tanks.

Circle No. 49 on Postcard

new

BJ

PYRAMID TOOTH

tong die

WON'T CHIP... soft ends...no eye injuries!

POSITIVE GRIP... grips like a die has never gripped before!

TOUGHER THAN EVER... built to take plenty of punishment and still keep going!

REVERSIBLE... does twice as much work at no extra cost!

BJ TONG DIES also available in Standard Tooth and Coarse Tooth styles. Made in all types for all tongs.

REMEMBER...
look for the red box with the big "BJ"

Stocked by supply stores in every field...or ask your BJ representative.

Another **BJ** *Engineered Product*

Byron Jackson Co.
Since 1872
MAIN OFFICE & PLANT: LOS ANGELES 54, CALIF.
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JOBBERS IN ALL PRINCIPAL OIL FIELDS

Catalogs AND EQUIPMENT *Literature* OFFERED IN THIS ISSUE'S ADVERTISEMENTS

Copies may be obtained easily and without cost by using Reader Service Postcard. Just circle on the card the number at the end of each item in which you are interested. Postcards are on page 113.

ALLOY BITS—Cable tool catalog. Acme Fishing Tool Co. See advertisement page 372.
Circle A2 on postcard.

MACHINE SHOP WORK—Information. Acme Foundry & Machine Co. See advertisement page 306.
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AERIAL MAPPING SERVICE—Information. Aero Service Corp. See advertisement page 151.
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WATER FLOODING PUMPS—Data sheets. The Aldrich Pump Co. See advertisement page 60.
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PUMPING UNITS—Catalog 151. American Manufacturing Co. of Texas. See advertisement page 6.
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SAFETY CLAMP—Information. Baash-Ross Tool Co. See advertisement page 131.
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PIPE AND BOLT MACHINE—Bulletin E. Beaver Pipe Tools. See advertisement page 295.
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BRAIDED WIRE SLINGS—Catalog. Bethlehem Steel Co. See advertisement page 109.
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CRUDE OIL HEATERS—Information. Black, Sivalls & Bryson, Inc. See advertisement page 333.
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DRILLING EQUIPMENT—Catalog. The Brewster Co. See advertisement page 4.
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GAS LIFT EQUIPMENT—Catalog. Camco, Inc. See advertisement page 17.
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DRAW WORKS—Catalog. Cardwell Manufacturing Co. See advertisement pages 92 and 93.
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CHECK VALVES—Catalog 11. Catawissa Valve & Fittings Co. See advertisement page 381.
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UNDERSURFACE LUBRICANT—Free demonstration. Champion Products, Inc. See advertisement page 371.
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ENGINES—Information. Chrysler Corp. See advertisement page 55.
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ENGINES—Information. Climax Engine and Pump Mfg. Co. See advertisement page 32.
Circle D14 on postcard.

GEARED HOISTS—Bulletin 09C. Coffing Hoist Co. See advertisement page 375.
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VALVES—Literature. Crane Co. See advertisement page 75.
Circle E11 on postcard.

CENTRIFUGES—Bulletin. W. H. Curtin & Co. See advertisement page 366.
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DIESEL ENGINES—Literature. Detroit Diesel Engine Division. See advertisement page 15.
Circle E14 on postcard.

SWAB CUPS—Literature. E. I. du Pont de Nemours & Co. See advertisement page 27.
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GAS LIFT EQUIPMENT—Catalog. Garrett Oil Tools, Inc. See advertisement pages 252 and 253.
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V-BELTS—Catalog. The B. F. Goodrich Co. See advertisement page 9.
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WALL SCRAPER—Bulletin 20. Grant Oil Tool Co. See advertisement page 358.
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VALVES AND REGULATORS—Data. Grove Regulator Co. See advertisement page 299.
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ROD PUMPS—Data. Harbison-Fischer Mfg. Co. See advertisement page 261.
Circle G13 on postcard.

FLANGES AND FITTINGS—Literature. Harrisburg Steel Corp. See advertisement page 348.
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TUBING HANGERS—Bulletin. Hercules Tool Co. See advertisement page 394.
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OIL SUCTION AND DISCHARGE HOSE—Data. Hewitt-Robins, Inc. See advertisement page 326.
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CASING HEADS—Bulletin. Hinderliter Tool Co. Div. See advertisement page 393.
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PARAFFIN SCRAPERS—Data. J. M. Huber Corp. See advertisement page 389.
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CORROSION INHIBITOR—Data. Humble Oil & Refining Co. See advertisement page 40.
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DRILLING RIGS—Bulletin CC-51. Ideco. See advertisement pages 216 and 217.
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ENGINES—Catalog A-384-NN. International Harvester Co. See advertisement page 45.
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CORROSION RESISTANT METALS—Booklet. The International Nickel Co. See advertisement page 30.
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DUCTILE IRON—Literature. The International Nickel Co. See advertisement page 347.
Circle J2 on postcard.

BIT REBUILDING—Data. Johnson Specialty Shop. See advertisement page 363.
Circle J8 on postcard.

HYDRAULIC JAR—Literature. M. O. Johnston Oil Field Service Corp. See advertisement page 349.
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CORE DRILL RIGS—Bulletin. Joy Manufacturing Co. See advertisement page 141.
Circle J14 on postcard.

SAFETY LIGHTS—Catalog. Justrite Manufacturing Co. See advertisement page 300.
Circle J15 on postcard.

AUTOMATIC TUBING SPIDER—Bulletin 23151. Kinzbach Tool Co. See advertisement page 385.
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PUMP PISTONS—Brochure. MacClatchie Mfg. Co. See advertisement page 50.
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WIRE ROPE—Bulletin 5025. Macwhyte Co. See advertisement page 5.
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PRESSURE GAUGES—Catalog. J. P. Marsh Corp. See advertisement page 62.
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TORQUE GAUGES—Literature. Martin-Decker Corp. See advertisement page 52.
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BACK-OFF TOOL AND FREE-POINT DETECTOR—Catalog. McCullough Tool Co. See advertisement page 391.
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CENTRIFUGAL PUMPS—Data. McGowan Pump Division. See advertisement page 377.
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PUMPS AND BAILERS—Descriptive price list. Miller Sand Pump Co. See advertisement page 264.
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HIGH SPEED CHAIN—Catalog C 72-51. Morse Chain Co. See advertisement page 57.
Circle M13 on postcard.

WELL CASING—Bulletin 352. The National Supply Co. See advertisement pages 86 and 87.
Circle M14 on postcard.

AUTOMATIC GRIP ELEVATORS AND SPIDERS—Bulletin. The National Supply Co. See advertisement page 88.
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SUCKER ROD SOCKETS—Catalog 10. Walter O'Bannon Co. See advertisement page 390.
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OIL DRILLING MUDS—Catalog. Oil Base, Inc. See advertisement page 63.
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CASING HANGER—Booklet. Oil Center Tool Co. See advertisement pages 198 and 199.
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HIGH PRESSURE CHOKE—Literature. Oil Center Tool Co. See advertisement page 374.
Circle N10 on postcard.

LINERS, PACKING ASSEMBLY AND PULLER—Catalog P-122. Oil Well Manufacturing Co. See advertisement page 378.
Circle N11 on postcard.

DRILLING RIG—Booklet 1-51. Oil Well Supply Co. See advertisement page 11.
Circle N12 on postcard.

PIPE LINE PUMPS—Booklet 13-51. Oil Well Supply Co. See advertisement page 274.
Circle N13 on postcard.

WEED KILLER—Literature. Pacific Coast Borax Co. See advertisement page 258.
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ELECTRIC PARAFFIN HEATERS—Literature. Parelex Corp. See advertisement page 328.
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OIL SEPARATORS—Bulletin. Peerless Manufacturing Co. See advertisement page 251.
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HYDRAULIC PUMPING UNIT—Catalog. Pelton Water Wheel Co. See advertisement page 56.
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LOGGING SERVICE—Catalog. Perforating Guns Atlas Corp. See advertisement page 353.
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OIL SHOW—Information. Permian Basin Oil Show. See advertisement Page 80.
Circle P15 on postcard.

PARAFFIN SCRAPERS—Data. Petroleum Specialty Co. See advertisement page 269.
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REAMERS—Information. Petroleum Tool Co. See advertisement page 368.
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PIPE LINE DITCHER—Folder. Pewthers Ditcher Co. See advertisement page 298.
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INTERNAL PIPE LINE PROTECTION—Folder. Pipelife, Inc. See advertisement page 281.
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AIRCRAFT—Literature. Piper Aircraft Corp. See advertisement page 267.
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OIL LOANS—Information. Property Credit Corp. See advertisement page 344.
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ROTARY HOSE—Bulletin 6898. Raybestos-Manhattan, Inc. See advertisement page 213.
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PIPE THREAD COMPOUND—Literature. Rectorseal. See advertisement page 388.
Circle R3 on postcard.

ELECTRIC SUB-SURFACE PUMPS—Information. Reda Pump Co. See advertisement page 272.
Circle R4 on postcard.

LINE PIPE—Literature. Republic Steel Corp. See advertisement page 16.
Circle R9 on postcard.

ROLLER BEARINGS—Data. Rollway Bearing Co. See advertisement page 24.
Circle R14 on postcard.

OIL AND GAS SEPARATORS—Bulletin 1951-W. Rolo Manufacturing Co. See advertisement page 346.
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OIL FLUOROSCOPE—Folder. Rotary Engineering & Mfg. Co. See advertisement page 369.
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EXCHANGER TUBE TESTER—Literature. Shell Development Co. See advertisement page 44.
Circle S11 on postcard.

PARAFFIN SCRAPERS—Catalog. Sunshine Iron Works. See advertisement page 350.
Circle T10 on postcard.

FABRICATING SERVICE—Booklet. Superior Iron Works & Supply Co. See advertisement page 49.
Circle T11 on postcard.

VALVE SEAT AND GEAR PULLER—Bulletin: Oil 49. Templeton, Kenly & Co. See advertisement page 212.
Circle T13 on postcard.

OIL WELL CEMENT—Bulletin. Universal Atlas Cement Co. See advertisement page 68.
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PIPE COUPLINGS AND FITTINGS—Catalog 44-81. Victaulic Company of America. See advertisement page 66.
Circle V3 on postcard.

SPUDDERS—Data. Walker-Neer Machine Co. See advertisement page 143.
Circle V6 on postcard.

DIESEL ENGINES—Bulletins 1415-1418. Waukesha Motor Co. See advertisement page 36.
Circle V7 on postcard.

ROLLER CHAINS—Catalog. Whitney Chain Co. See advertisement page 48.
Circle X1 on postcard.

WIRE ROPE FIELD HANDBOOK. Wickwire Spencer Steel Division. See advertisement page 41.
Circle X3 on postcard.

DRILLING RIGS—Catalog 182. Wilson Manufacturing Co. See advertisement pages 185 and 186.
Circle X4 on postcard.

PORTABLE COMPRESSOR UNITS—Information. Wilson Supply Co. See advertisement pages 244 and 245.
Circle X5 on postcard.

GAS COMPRESSORS—Bulletin L-640-B1B. Worthington Pump & Machinery Corp. See advertisement page 209.
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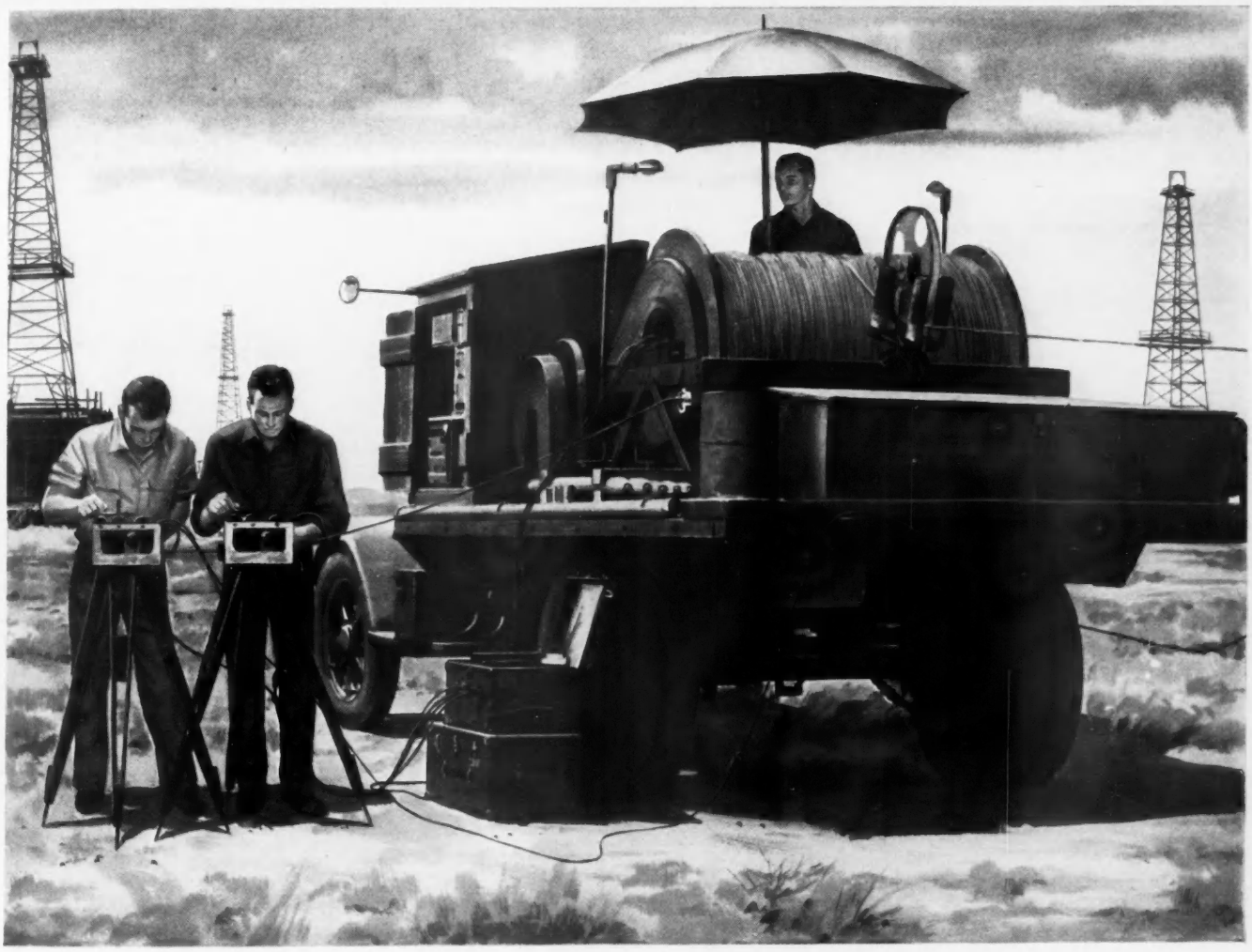
Exploration Section

L. J. LOGAN, SECTION EDITOR

WORLD OIL



CHAPTER EIGHT in the Fascinating Story of the Search for Oil

In 1938 The electrical well logging method, pioneered and developed by Conrad and Marcel Schlumberger as early as 1928, was thoroughly proved and accepted during its first decade of service, and by 1938 "a Schlumberger" had become synonymous with the search for new oil reserves.

"This method, which consists essentially in measuring the electrical resistivity and potential along the walls of a drill hole by introduction of a series of electrodes, not only gives exceedingly important information as to oil, gas and water content of formations penetrated, but also yields a log which, for correlation purposes, is often superior to any other type of log and which in specific cases may be of even greater utility than a complete core section," reported E. De Golyer in a lecture delivered at Princeton University in 1939.

The early electrical logs were plotted by hand, as pictured in this illustration of recording in California in 1932. Present day logs are recorded photographically on film and four or more curves can be recorded simultaneously on the same log.

In 1951 Since new and improved instruments are still the key to future progress in the endless search for new oil reserves, General maintains extensive laboratories of its own to develop and improve dependable equipment to meet specific needs for various areas. In the hands of capable crews who are qualified by training and experience to accurately compile and interpret seismograph data, General instruments have helped many operators to determine and locate conditions favorable to finding new oil reserves. Let General's crews help you.

General GGC
GEOPHYSICAL COMPANY
GULF BLDG. HOUSTON

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The renewable resilient seat of the Cameron Flex-Seal Mud Line Valve distinguishes it from conventional valves having a metal-to-metal seat. The resilient seat absorbs, slowly and evenly, the cutting action of the mud, and, when finally worn out after long service, may be easily replaced at the rig for only a few dollars. It is made of the toughest oil- and acid-resistant rubber and has been known to outlast ordinary steel valve seats ten to one. Its resiliency insures a pressure-tight seal despite trash on the seat. Should the gate become sand cut, the rubber seat flows into the irregularities to effect a positive shut-off.

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The Spraberry Play in West Texas

Looking north over the Spraberry trend in Midland County.

By R. C. SENNING
Production Geologist, El Capitan Oil Company

DISCOVERY of a potentially great source of oil reserves in the Spraberry sand section, a Lower Permian sandstone of the Midland Basin, has unleashed a surge of leasing and wildcatting that has scattered over an eight-county area.

The West Texas Permian Basin, where oil production has been predominantly from limestone and dolomite reservoirs, has suddenly awakened to the fact that a good portion of the Midland Basin contains a sandstone reservoir of major importance. And that Midland County, which until recently, had only a few spotted Pre-Permian discoveries, is the center of a major trend play about 150 miles long and 50 miles wide.

Since the completion of the Seaboard Lee 2-D as the first Spraberry producer in January, 1949, the Spraberry sand had produced as of June 1, 1951, a total of 2,903,155 barrels of oil from 248 wells. Of this, 1,508,789 barrels were produced from the Tex-Harvey pool of Midland County.

At first the discovery of the new pay aroused little interest and even the discovery of the Tex-Harvey Floyd 1, opener for the Tex-Harvey pool, was generally ignored. Tempo of development progressed slowly through 1950 and it was not until the spring of 1951 that it reached booming proportions.

At this writing, there are 203 drilling wells along this trend and 134 staked locations. Of the drilling wells, 140 are field wells and 63 are wildcats. Midland County leads in activity with 78 field wells, 10 wildcats, and 63 new locations.

THE SPRABERRY sandstone of the Lower Permian is a new and important source of high gravity, sweet oil for the Midland Basin of West Texas. Development has been booming since last spring. Leasing and wildcatting have spread over an area 150 miles long and 50 miles wide, covering parts of eight counties. The production history and reservoir characteristics of the Spraberry sand prove the pay of great importance from both the economic standpoint and the standpoint of reserves. A recent count showed 203 wells drilling along the Spraberry trend, including 140 field wells and 63 wildcats.

Although the Spraberry is considered highly overrated by many and its crude producing ability has been doubted, a close study of the production history and reservoir characteristics proves the pay to be of great importance both from an economic standpoint and from the standpoint of reserves.

Although the Spraberry sand was first recognized in the Seaboard A. J. Spraberry 1, a wildcat in the now producing Spraberry Deep pool of east central Dawson County in 1943, the first commercial producer from this new pay was the Seaboard Lee 2-D in the same pool. Drilled to the Ellenburger, it was plugged back and completed on January 22, 1949, from 6420 to 6700 feet in the Upper Spraberry with an initial production of 319 barrels of oil per day flowing.

About 65 miles south of this discovery the Tex-Harvey Floyd 1, a wildcat in east central Midland County, was completed February 24, 1949, to open up the second Spraberry pool in West Texas. Drilled to a total depth of 12,063 feet in the Ellenburger, it was plugged back and

completed through casing perforations from 7865-75 feet and from 8045-55 feet opposite the Lower Spraberry. It was potentialed for 135 barrels of oil plus 13 percent water pumping. Then in May of 1951 it was re-worked and the casing opposite the Upper Spraberry was perforated from 7080-90 feet and from 7235-45 feet. It was then re-potentialed for 106 barrels of oil per day pumping. Despite the importance of this discovery it was not until December, 1949, that the second and third wells in this pool were completed.

One month later it spread to Borden County when the one-well North Gail pool in the northwestern part of the county was discovered by the Hunt Clayton & Johnson 1. It was plugged back from the Pennsylvanian and completed for 40 barrels of oil per day and 15 water pumping from the Upper Spraberry from 5730-45 feet.

In 1950 the first indication of a major trend was brought to light by six discoveries. On January 8, the Humble Pembrook 1 in northeastern Upton County was plugged back from total depth of 12,660 feet to 7169 feet and completed through casing perforations opposite the Upper Spraberry from 7030-7100 feet. It potentialed for 34 barrels of oil plus 4.25 barrels of water pumping.

On March 6, the Germania pool in northeastern Midland County was discovered by the Snowden Faskin 1. Completed in the Upper Spraberry from 7125-7343 feet, this well was potentialed for 69.5 barrels of oil flowing. The pattern was now beginning to take shape.

Forty-five miles south of the Tex-Harvey area the Spraberry was next developed as a new pay on the north end of the multi-pay Benedum pool in east central Upton County in the Republic Natural Gas Barnett 1. This well was completed April 3, from 7500-40 feet in the Lower Spraberry for 33 barrels of oil plus 4.3 percent water pumping.

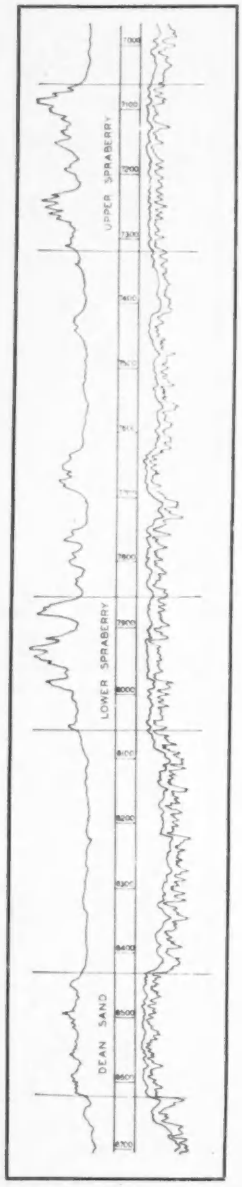
The play then shifted to the southwestern portion of Midland County where Humble's Midkiff 1 was completed November 9, for 80 barrels of oil plus five barrels of water pumping. The producing section was from 7304 to 7520 feet in the Upper Spraberry. This opened up a new area approximately halfway between the Pembrook and the Tex-Harvey areas.

Dawson County, where the first discovery was made, had two widespread discoveries in the latter part of 1950. In the central part of the county, the Manning-Huddle pool was opened November 17 by the Manning Huddle 1, which was potentialed for 186.24 barrels of oil per day flowing from 7856-8026 feet in the Upper Spraberry. It has been plugged back from 9914 feet in the Pennsylvanian reef. On December 1, the Standard of Texas Smith 1 in the extreme north central part of the county opened the Smith-Spraberry pool. With production coming from 7940-73 feet in the Lower Spraberry after having been plugged back from 9685 feet in the Pennsylvanian lime, it was potentialed for 73 barrels of oil per day flowing.

Meantime the productive area of the Tex-Harvey pool had been extended eastward across the county line into Glasscock County by the Russell Wrage-Hendrickson 1-20. This well was completed November 12, for 184 barrels per day flowing from 6910-7175 feet in the Upper Spraberry. Development then returned to southeastern Midland-northeastern Upton County area.

About six miles south of the Tex-Harvey area the Weiner Driver 1-16 opened a new area on January 26, 1951. This well was completed in the Upper Spraberry from 7110-7325 feet and potentialed for 303.62 barrels of oil flowing. Then on February 13, 1951, the Weiner-Floyd area in the northeastern corner of Upton County was discovered by the Weiner Braden 1 which was potentialed for 452 barrels per day flowing through casing perforations from 6986-96 feet in the Upper Spraberry.

Martin County then came into the picture with Gulf Glass 1-E making a Lower Spraberry discovery in the southwestern part of the county. Completed February 17, this well potentialed for 100 barrels flowing after plugging back from 12,915 feet in the



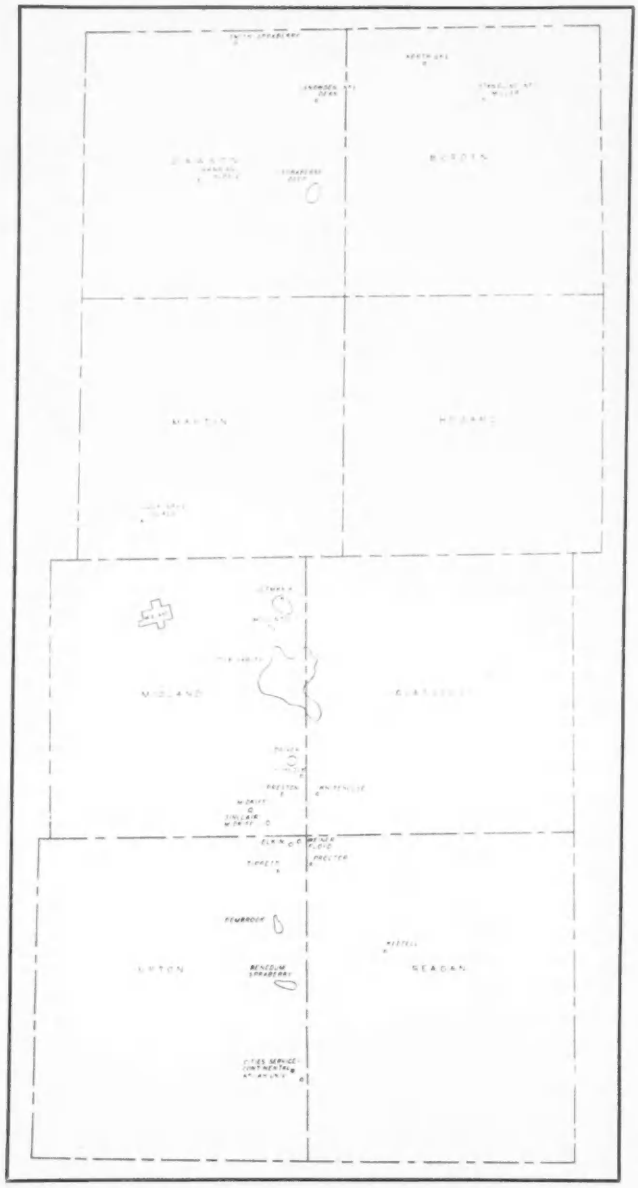
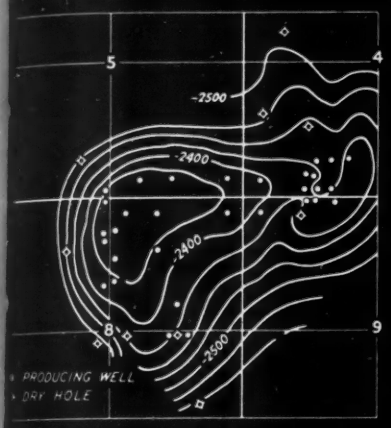
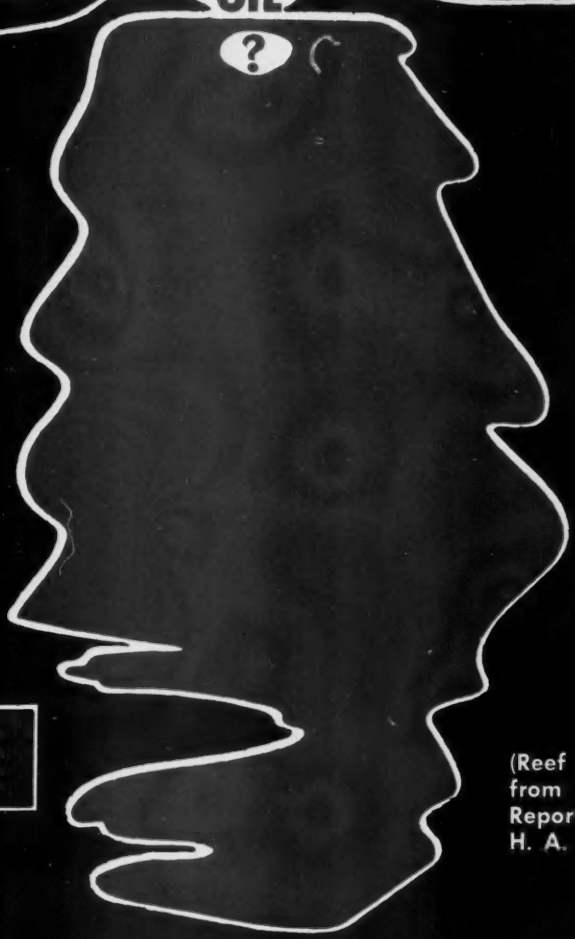


FIGURE 1 (left). A typical Spraberry section as illustrated by a Schlumberger log showing the relation of the Upper Spraberry to the Lower Spraberry and the position of the Dean sand.
FIGURE 2 (right). Development map showing only those areas producing from the Spraberry, and their relative positions.

Are you looking for Reefs?



Subsurface map on the Albany (Chattanooga) formation, about 50 feet above the Devonian top.



SSC's 1939 seismic map contoured on a reflecting horizon approximating the Devonian top.

(Reef outline and description adapted from Illinois State Geological Survey Report of Investigations No. 145 by H. A. Lowenstam.)

SANDOVAL REEF (Illinois)

MARION COUNTY

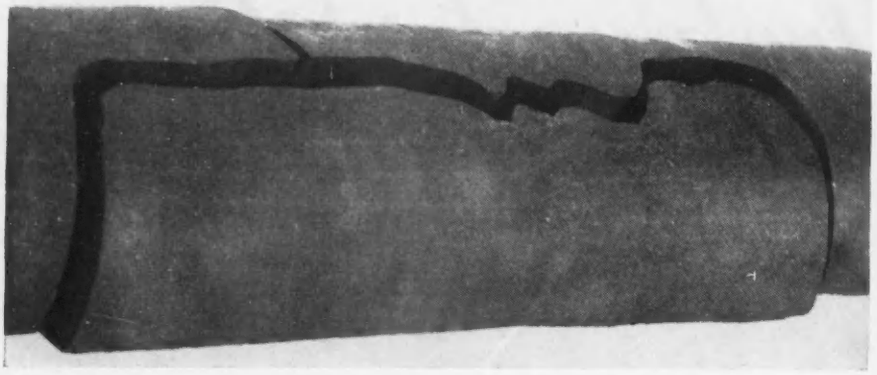
The Sandoval reef, approximately cuboidal in horizontal section, is considered to be located near the southern edge of the Silurian reef archipelago. It differs from the Marine reef in its smaller areal extent (about one square mile), and in its greater vertical thickness (about 1000 feet)—one of the tallest reefs found thus far in the area. Most of the oil accumulation associated with the Sandoval reef occurs in draped Mississippian and Devonian horizons, although some production may occur in the upper reef zone.

The configuration of the seismic contours on the Sandoval structure was somewhat disconcerting to the interpreters in 1939 because of the steep dips, the irregular outline, and non-alignment with known structural trends. The recently established association of the structure with a tall reef mass now explains these irregularities.

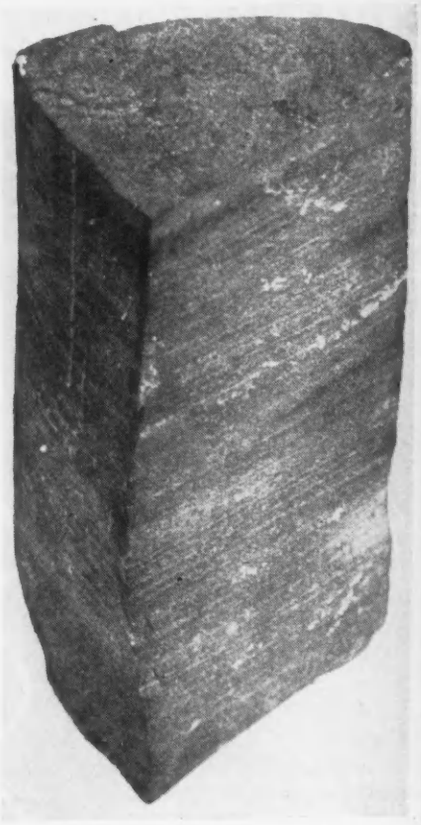
Thus, the necessity for detailed seismic surveys and a careful analysis of the seismic data, in the light of the current geological knowledge is emphasized. This reef is an example of SSC's recognition and use of this approach.

Seismograph Service Corporation

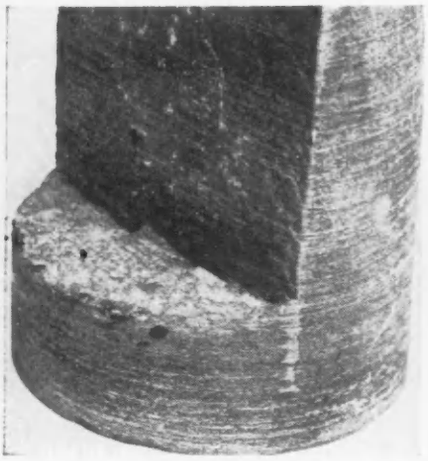
TULSA, OKLAHOMA, U. S. A.



View of core from shale section above Spraberry sand which was halved by a vertical fracture and then parted along a zone of weakness not parallel to its bedding planes.



Core with two intersecting vertical fractures.



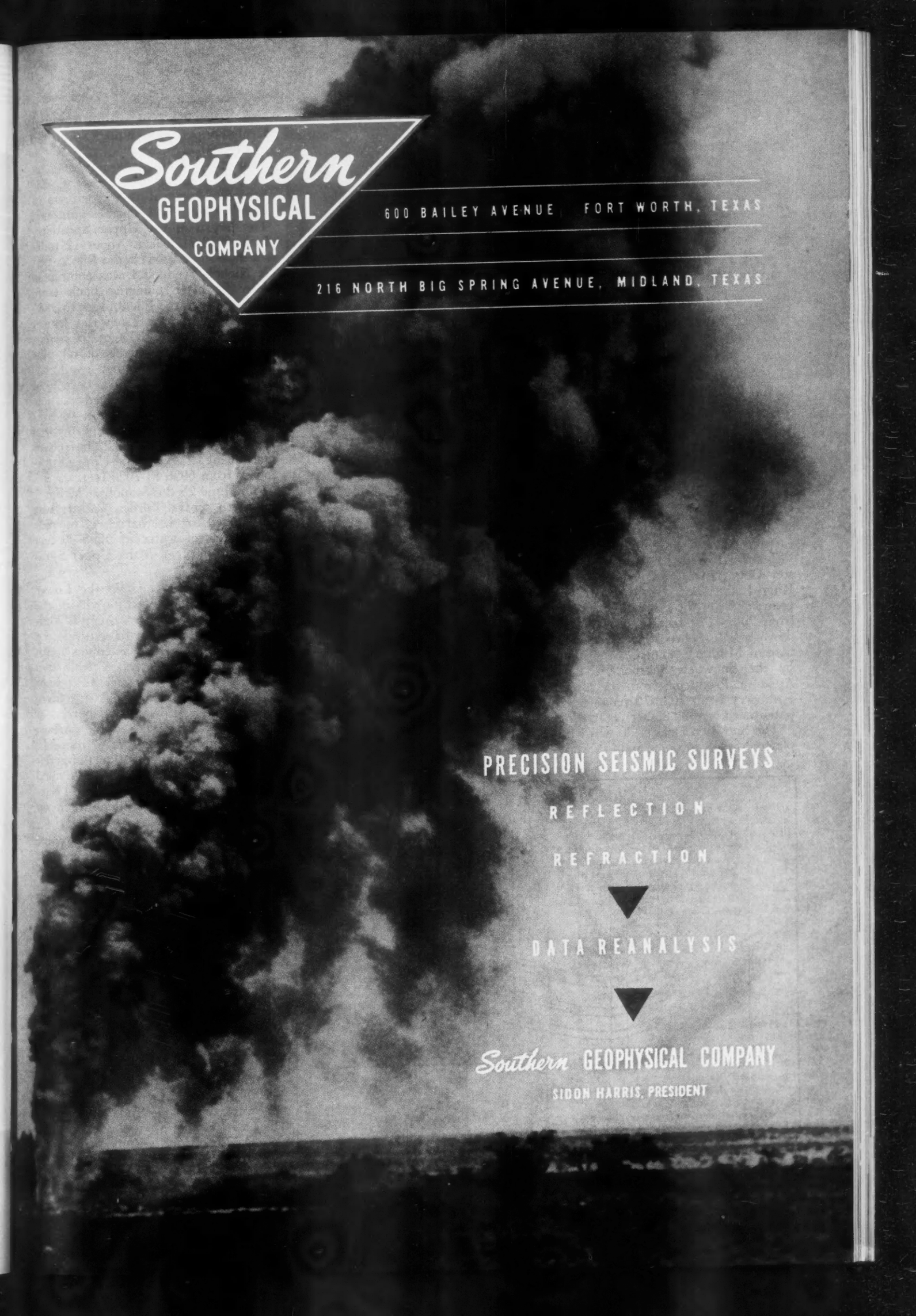
This core from the Spraberry sand illustrates the phenomenon of a fracture which ends near the base of the core.

Core with layer of cement on the face of a vertical fracture which bisected core from approximately 70 feet below casing show.

This core is bisected by one fracture and contains parallel fracture ending near center.

The unusual polygonal shape of this core results from the intersection of four vertical fractures.

Core from shale above Spraberry with fracture similar to that illustrated in upper left photo.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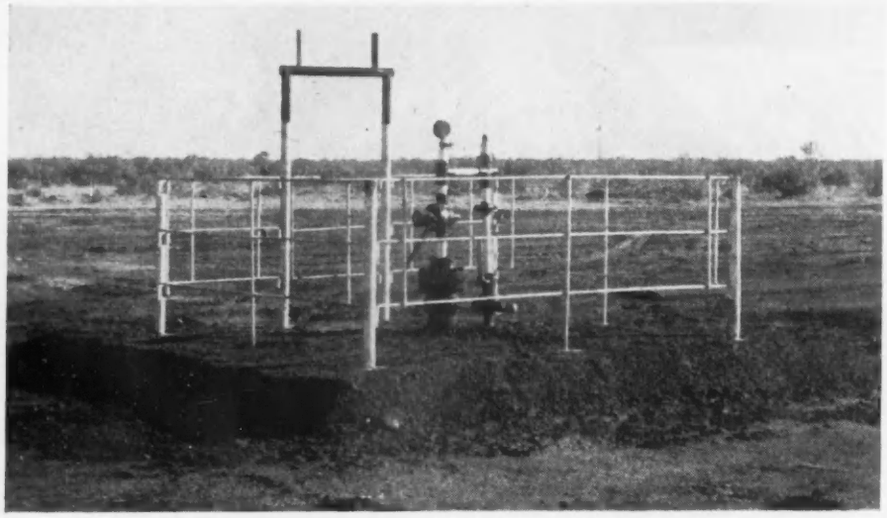

Typical flowing well hookup for Spraberry wells.

Ellenburger to 8800 feet.

An area about half way between the Tex-Harvey and the Germania pools was opened March 16, by the Snowden McClintic 1-58. It completed in the Upper Spraberry from 7209-7529 feet and was potentialed for 66.5 barrels pumping.

The Elkin area of northeastern Upton County was discovered by the Ring Elkin 1 on April 28. It was completed in the Upper Spraberry from 7064-7122 feet for 125 barrels flowing. The Schrock area of southeastern Midland County was opened by the Snowden Schrock 1-34 on April 16. Producing from the Upper Spraberry from 7025-75 feet, it was potentialed for 392.82 barrels flowing.

The Snowden Dean 1-30 was completed May 3 to open another Dawson County area about ten miles north of the original discovery for the Spraberry. Producing through casing perforations from 7288-98 feet opposite the Lower Spraberry, it was completed for 160.09 barrels pumping. In northeastern Upton County the Barnhart Tippett 1 opened a new area on May 14. Producing from the Upper Spraberry from 7170-7233 feet, it was potentialed for 343 barrels flowing.

Just four miles south of the Driver area, the Preston area was opened by the Magnolia Preston 1 on May 18. The casing opposite the Upper Spraberry was perforated from 7098-7106 feet, 7114-26, 7134-48, 7163-79, 7228-44, and 7265-7310 feet. It was potentialed for 109.6 barrels pumping.

Between the Midkiff and the Weiner-Floyd areas, the Sinclair Midkiff 1 was completed May 19 for 325 barrels flowing. The casing was perforated opposite the Upper Spraberry from 7190-7226 feet.

In the northwestern corner of Reagan County the Texas Crude Proctor 1 opened the Proctor area May 24 for 70.71 barrels pumping. The pay is in the Upper Spraberry from 6910-7128 feet. About 12 miles southeast of this well the Blackwood & Nichols Weddell 1 was completed May 24 after plugging back from 11,548 feet in the Ellenburger to 7185 feet. Production is from the Lower Spraberry at 7145-85 feet. It potentialed for 209.23 barrels of oil plus 19 percent water flowing.

Then the southwestern corner of Glasscock County received a new area when the El Capitan Whitehouse 1 was completed June 6 for a natural potential of 322.23 barrels of oil flowing. Pay is in the Upper Spraberry from 6936 to 7028 feet.

On June 25 the Stanolind Miller 1 in north central Borden County was completed for 121 barrels of oil plus 37 barrels of water at 5265-90 feet and 5310-30 feet in the Upper Spraberry.

An important show in the Lower Spraberry was encountered in the Cities Service and Continental University AH 1 wildcat in southeastern Upton County about six miles south of the Benedum area. A drill-stem test at 6320-92 feet in the Upper Spraberry had no shows. A drill-stem test in the Lower Spraberry at 7128-85 feet had gas to the surface in five minutes and oil in 47 minutes. It flowed an estimated 10 to 12 barrels of oil per hour. The well was drilled on down and completed for 2044 barrels daily from the Ellenburger on January 23.

It has now come to the point where it is difficult to determine just what constitutes a wildcat in this area. As long as a well is drilled in the general trend it appears to be semi-proven.

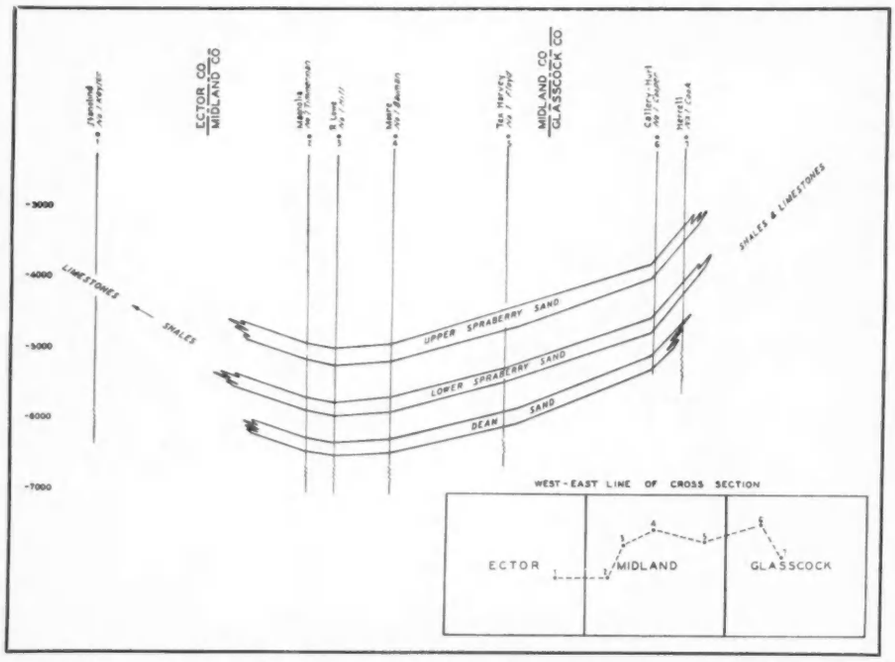

FIGURE 3. Generalized cross-section across the Midland Basin showing the structural positions of the Spraberry section and the Dean sand and how they grade out to the east and to the west.

Geology of Area

The Spraberry sand is a lower Permian sandstone which occurs in the lower part of the Leonard section and is generally confined to the Midland Basin province of the West Texas-Southeast New Mexico Permian Basin.

Where this section is approximately 1000 feet thick over most of the trend area it has been found to be 1115 feet thick in the Spraberry deep pool of Dawson County and reached a maximum of 1520 feet in southern Lynn County. The minimum thickness, 935 feet, was found in north-

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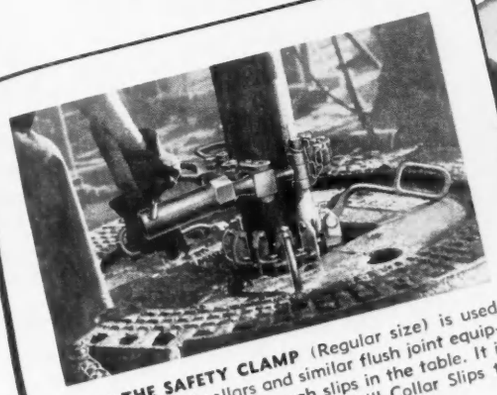

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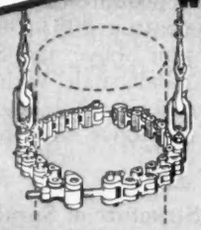

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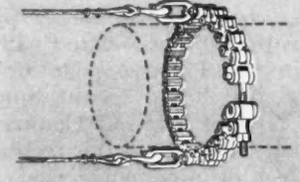

FOR PULLING pipe lines or pipe sections into alignment for welding, coupling or positioning, a Safety Clamp fastened around the pipe provides a slip-proof grip for pulling manually or mechanically.

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western Dawson County. The section is divided into three parts: the Upper Spraberry sand, an intermediate zone, and the Lower Spraberry sand. The Upper Spraberry is approximately 250 feet thick (300 feet thick in the Spraberry deep pool of Dawson County) and usually consists of three sand bodies separated by black shales and thin lime stringers. The sand is gray in color and is from fine to medium-fine in grain size. The uppermost of these three sand bodies is generally referred to as the "Floyd sand." These sands are from 30 to 60 feet thick. The Lower Spraberry sand usually consists of four sand bodies which range in thickness from 30 to 50 feet. These are also separated by thin shale and limestone streaks. The over-all thickness of the Lower Spraberry is approximately 250 feet (about 300 feet in the Spraberry deep pool). The intermediate zone is made up of alternating sands, shales, and limestone stringers.

The texture of the sand is practically the same throughout the trend, but the sand from central Martin County north is cleaner than the sand to the south which tends to be more silty, shaley, and often limey.

The Spraberry section occurs in the Midland Basin in a lenticular form and loses its identity along the edge of this basin by grading laterally into shale on the west side of the basin. To the south it grades into shales and undifferentiated sands. To the north and east it grades into limestones or shales.

About 350 to 400 feet below the base of the Spraberry section is the Dean sand, which is generally considered to be at or near the top of the Wolfcamp. This sand body, which is approximately 200 feet thick, was first described in the Gulf Dean 1 in northeastern Dawson County.

A typical sample log of the lithology encountered during the drilling of a Spraberry sand test shows red beds down to about 1600 feet to the top of the anhydrite, then anhydrite, red beds, and thin beds of salt down to the Yates sand at around 2300 feet. From this point to the top of the main salt body at about 2800 feet the section is composed of anhydrite, red sands, and thin salt stringers. The main salt body is usually about 500 feet thick and continues to around 3300 feet where the section is then predominately anhydrite down to the top of the Grayburg lime at around 3800 feet. The Grayburg and the following San Andres section are about 1400 feet thick and are made up of lime, sandy lime, dolomite, sand, and thin beds of black shale in the lower part.

The San Angelo section, which is topped at about 5200 feet, and the underlying Clearfork consist of around 1800 feet of sand, dolomite, shale, and sandy shale and dolomite before the top of the Spraberry sand section is encountered at around 7000 feet. The bottom 800 feet of this 1800-foot section above the Spraberry is predominately shale, with thin streaks of lime. This shale becomes very sandy just above the Spraberry section.

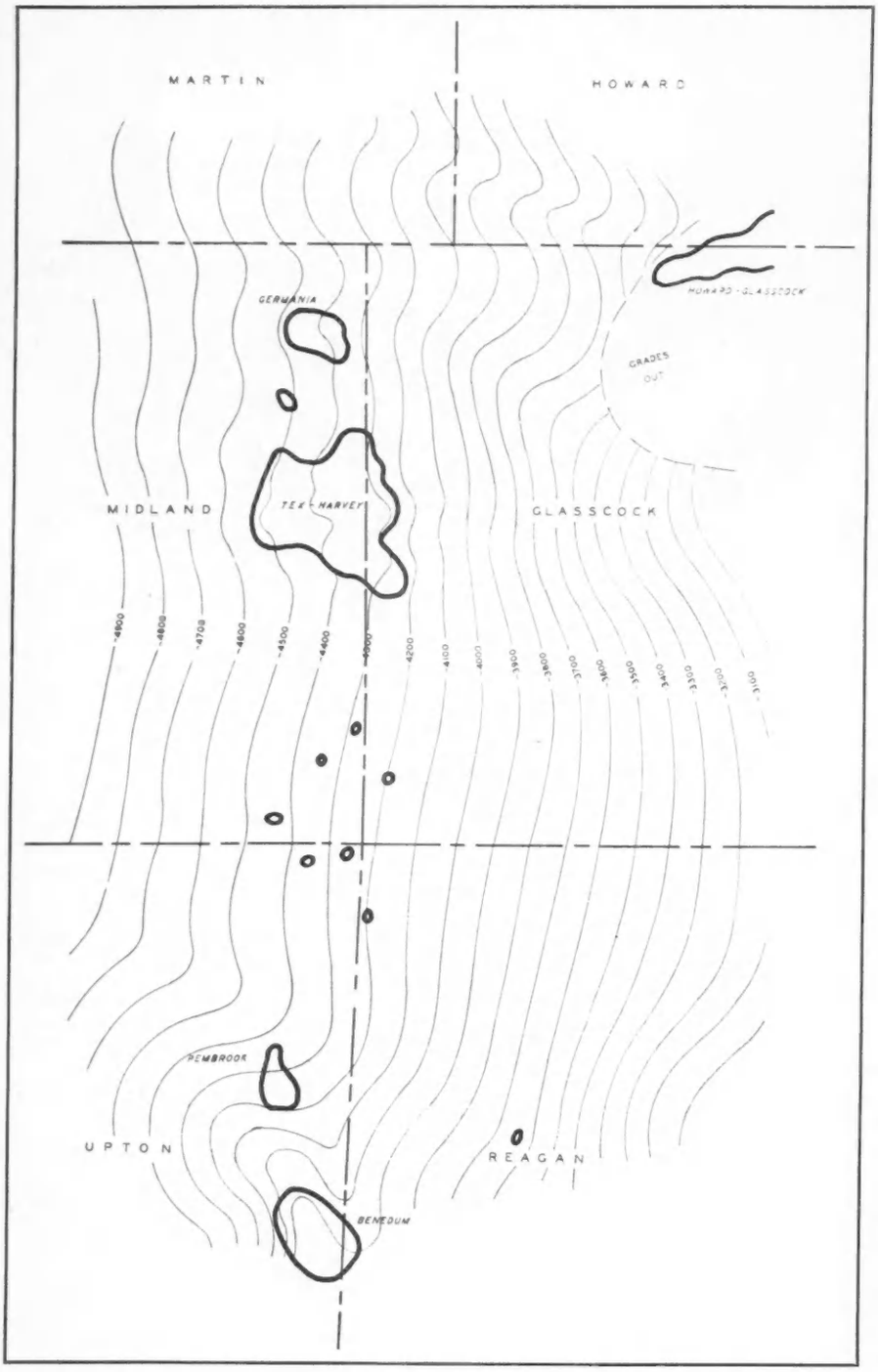

FIGURE 4. Structure map of the southern portion of the trend as mapped on the top of the Spraberry section, showing the relationship of production to structure. Contour interval is 100 feet.

Structure of Spraberry

There are two distinct types of structural conditions controlling accumulation of oil along this trend. From about the middle of Martin County north to include Dawson and Borden counties, Spraberry production is probably associated with reefing in the Pennsylvanian or other deep-seated highs. In the Spraberry deep pool of Dawson County there is about 2400 feet of this reefing with 250 feet of producing relief in the Spraberry overlying this deeper structure.

The pools on this trend from about

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the middle of Martin County south appear to be located on a broad monoclinal feature which dips westward into the deeper part of the basin at the rate of approximately 50 feet per mile. Accumulation of oil is apparently caused by what may prove to be a fairly continuous stratigraphic trap along the strike of this feature. One exception at the south end is the Benedum-Spraberry pool which may be associated with the deeper producing structure.

Production in the Upper Spraberry will possibly be limited on the downdip side of this feature to the west by lack of fracturing, plunging below water level, or both. The east or updip limits will possibly be limited by the discontinuance of fracturing in that direction. It is possible that the Lower Spraberry may cover a greater lateral extent.

Perhaps the most important feature of this reservoir is the occurrence of vertical fractures. In the northern end of the trend where the pools are associated with deeper highs, this fracturing does not exist, or does so to an insignificant degree. These fractures appear to be of the cleavage type and were probably caused by shearing. At some time after the deposition of the Spraberry sand section there was probably a period of uplifting and subsidence in this portion of the basin accompanied by shifting of some deeper beds which cracked and sheared this brittle sand as well as a portion of the sandy shale immediately above it. This produced a complicated system of vertical cross-fracturing.

Cores have shown a great variety of fracturing conditions. In some there have been as many as five or six separate fractures less than an inch apart parallel to each other and practically vertical. In others a single vertical fracture may run for several feet and then gradually wander off from vertical. When they leave the vertical plane they often converge with another vertical one. Where the fracture faces are usually flat, they have often been distorted as if twisted from the ends in opposite directions. Cross-fracturing has been observed in many cores, with a single end of one core showing as many as four fractures intersecting to form a polygon. Many show two intersecting at practically a 90 degree angle.

In width these fractures have varied from hairline to about one-eighth of an inch. Those which have been filled with cement under pressure are often wider. The least distance observed between two parallel fractures was 1/20 inch. This was found in a reverse circulation cutting. The lateral extent of any individual fracture can only be guessed, but the length in depth of one was noted as continuous for 88 feet.

From the standpoint of production and the amount of recoverable oil, these fractures should prove to be an asset. In a normal sandstone reservoir the tiny drops of oil must converge radially a great distance through the existing permeability to reach the bore hole. Spraberry oil has only to migrate to the nearest fracture, often less than an inch away, and then into the bore hole along good permeability when these fractures converge or cross each other naturally, or are artificially joined by some process. When this fact is considered, it is not hard to conceive of the fracture system being recharged due to pressure differential by a very slow migration of the oil through the low permeability of the sand.

Production history from the discovery well in the Tex-Harvey is somewhat confused, due to the fact that after producing 26,464 barrels of oil in 15 months from the Lower Spraberry, this well was recompleted in the Upper Spraberry, and shortly thereafter two additional wells were completed on the lease, flowing into the same tank battery. However, the Lake Floyd Estate 1 in the NW/4 of the SW/4 of Section 14, Block 37, T-3-s, in the Tex-Harvey pool had produced 39,960 barrels of oil in 16 months. During May, 1951, this well produced 2302 barrels, for an average of 74 barrels of oil per day flowing.

The vertical fracture system of this pay represents a hazard to the completion of wells in the reservoir. The fact that the shale immediately above the Spraberry sand is also fractured has caused poor cement jobs on oil strings. Where the sand has been drilled with mud or oil, there have been cases of lost circulation. Where casing has been set in the shale above the sand, cores have shown fractures filled with cement as far below the top of the sand as 100 feet. Lost circulation material and mud have also been found more than 100 feet below the top of the sand. This fracturing of the shale has been observed

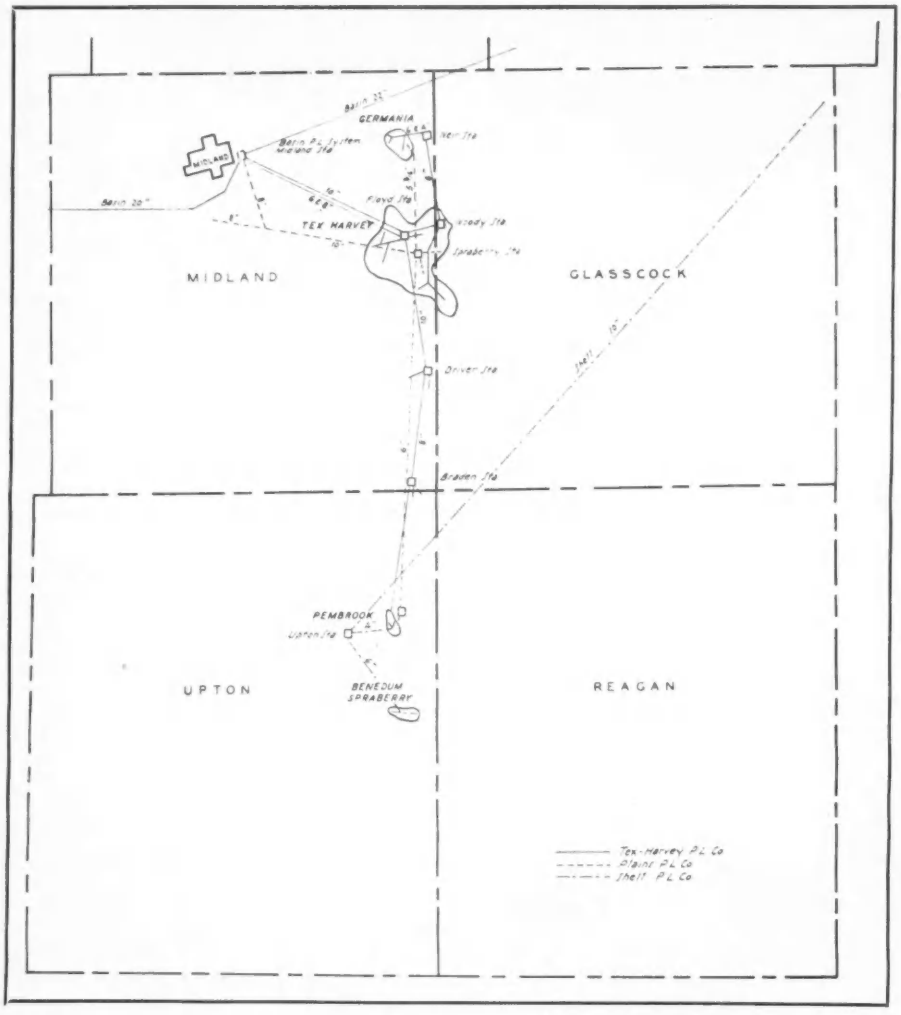

FIGURE 5. Pipe line map showing size of lines, pump stations, and distribution of lines for the Midland, Glasscock and Upton counties portion of the trend.

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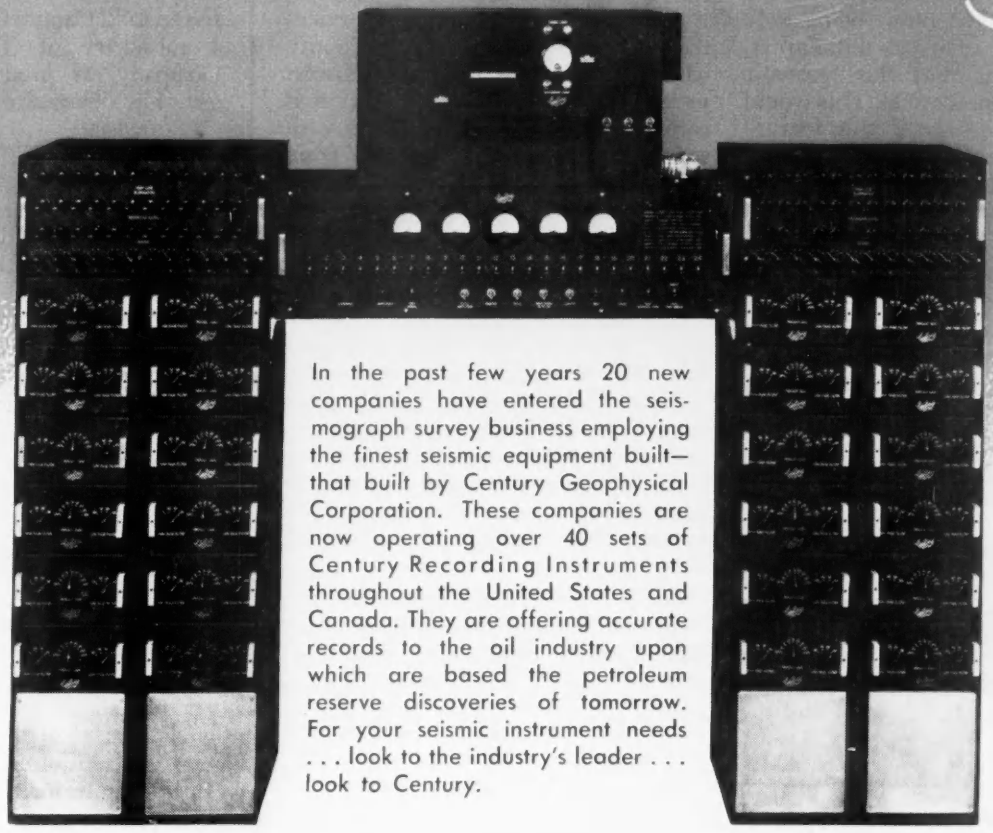

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not only in cores, but has been substantiated by the fact that on cable tool drilling-in jobs, where pipe has been set as high as 30 feet above the sand, large amounts of oil have come into the hole before the top of the Spraberry sand was even reached.

Core analysis results show the porosity and permeability in the Spraberry deep pool of Dawson County to be much better than that of the Midland-Glasscock portion of the trend. Permeability in the Upper Spraberry of the Spraberry deep pool ranges from 0 to 71 millidarcys, with the porosity ranging from 0 to 25 percent. In the Tex-Harvey pool in Midland and Glasscock counties the permeability ranges from 0 to 3 millidarcys and the porosity from 0 to 19 percent. With the majority of the permeability in the latter being only slightly greater than 0.1 millidarcys, it would appear that this reservoir would be non-commercial. This would probably be the case if this feature were not so highly fractured to provide permeability that does not lend itself to core analysis.

Pipe Lines

This new development on the southern portion of the trend is being serviced by three pipe line companies: the Tex-Harvey Pipe Line Company (Ashland Oil Purchasing Company), the Plains Pipe Line Company (Cities Service Oil Company and Phillips Petroleum Company), and Shell Pipe Line Company.

The Tex-Harvey Pipe Line Company has an eight-inch line from the Pembrook area north to its Braden Station in the southeast corner of Midland County and on north to its Driver Station. A ten-inch line then goes to the Tex-Harvey area and the Floyd Station. From there a six- and eight-inch line carries the oil on to Midland. The Germania area is serviced with a six- and four-inch line which goes to the Weir Station, and then a six-inch line carries the oil to the Woody Station in the Tex-Harvey area to the south. First a six-inch and then a ten-inch line takes it on to Midland.

The Plains Pipe Line Company has a six-inch line from the Pembrook area in Upton County north to the Tex-Harvey area. First a ten-inch and then an eight-inch takes this oil on to Midland. Their Spraberry Station in the Tex-Harvey also receives oil from the Germania area to the north by way of a 5 3/16-inch line. An eight-inch line to the Phillips Foster Station at Odessa is planned.

Shell Pipe Line Company services the Benedum area in Upton County with a six-inch line running northwest to its Upton Station. This station is connected to the Pembrook area with a four-inch line. Oil is moved from this station to the Foster Junction Station in Mitchell County by a ten-inch line.

The gathering systems are usually four-inch lines. After this oil reaches Midland, it is taken by the Basin Pipe Line System through a 22-inch line to Cushing, Okla., and from there on to the eastern states.

Gulf Pipe Line Company has announced a proposed line to serve this area. It is to be 43 miles of six-inch, running from northeastern Upton County to the Gulf Midland Station.

Reservoir Data

In May, 1951, bottom-hole pressure surveys were run in the Tex-Harvey and Germania pools in Midland County. The strip-type survey was utilized for accurate results. The wells on the north end of Tex-Harvey were allotted a strip three miles wide, due to the small number of wells. The center of the pool was divided into three strips one mile wide, and the southern end of the pool was surveyed as another unit.

Each strip was shut in for three days before the surveys were run and then opened again two days after the survey. To stagger these events, the northernmost strip was shut in on May 2, surveyed May 5, and opened on May 7, with the next strip being shut in on May 3, surveyed on May 6, and opened on May 8, etc.

Where the wells were shut in for 72 hours, the bottom-hole pressure ranged from 1570 to 2300 pounds at a subsea datum of 4400 feet. In those wells in the Germania area that were shut in for 72 hours, the bottom-hole pressures ranged from 1715 to 2080 pounds at a subsea datum of 4400 feet.

Where the average initial gas-oil ratios for these areas were from 700 to 800 cubic feet per barrel, some were reported a little lower than 300-1 and a few higher than 1000-1.

The gravity of the Spraberry oil, which is a sweet crude, averages from 36 to 38 degrees, with as low as 33 and as high as 41 being reported in a few wells. The price of this crude is currently $2.58 per barrel.

The allowable has been set by the Railroad Commission at 121 barrels of oil per day per producing day. There are 23 producing days to a month.

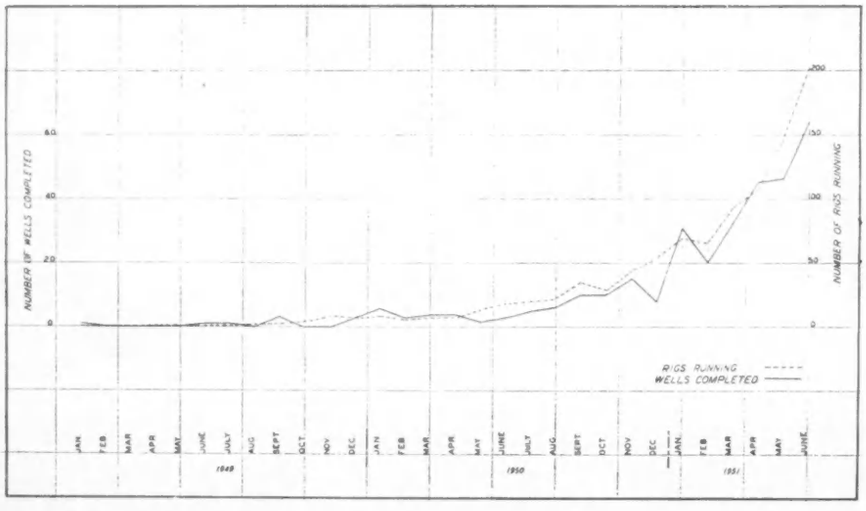
NUMBER OF WELLS COMPLETED
NUMBER OF RIGS RUNNING
RIGS RUNNING
WELLS COMPLETED
JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUNE
1949
1950
1951

FIGURE 6. Curves on the number of wells completed and the number of rigs running by months in the Spraberry trend since the discovery well was completed.

About the Author

R. C. SENNING studied geology at the University of Oklahoma and received a B.S. degree there in 1941. He went to West Texas in 1943 to join The Western Company as district geologist. In August of this year he was transferred to El Capital Oil Company, a subsidiary of The Western Company, as production geologist. His offices are in Midland.

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Deep Structures and Multi-Pay Fields Offer Significant Developments in West Texas

By JOHN C. RYAN and HARWARD L. FISHER
Geologists, University Lands, Midland, Texas

THE Permian Basin of West Texas has experienced a varied type of oil play during the past few years. Although the reef play, centering around Scurry County, and the Spraberry sand play in the Midland Basin have attracted more attention, there has been significant activity in the search for additional new reservoirs in unproven areas outside those plays as well as in the development of new pay horizons in old producing fields.

Notable is the exploration for deep-seated structures in the Midland-Upton counties area on the western side of the Midland Basin and the development of proven pay horizons in the new fields. On the Central Basin Platform to the west, considerable activity has been devoted to the development of extensive areas of new Permian pays in the Goldsmith and TXL fields of Ector County and the Dollarhide field of Andrews County.

SIGNIFICANT DEVELOPMENT is under way in West Texas in areas outside the Reef and Spraberry plays, as well as in those especially important areas. Noteworthy is the exploration for deep-seated structures in the Midland-Upton counties area on the western side of the Midland Basin and development of multiple pay horizons in the new fields. Other important activity has included that somewhat to the west, on the Central Basin Platform, involving development of extensive areas of new Permian pays in the Goldsmith and TXL fields of Ector County and Dollarhide field of Andrews County.

Pegasus Ellenburger

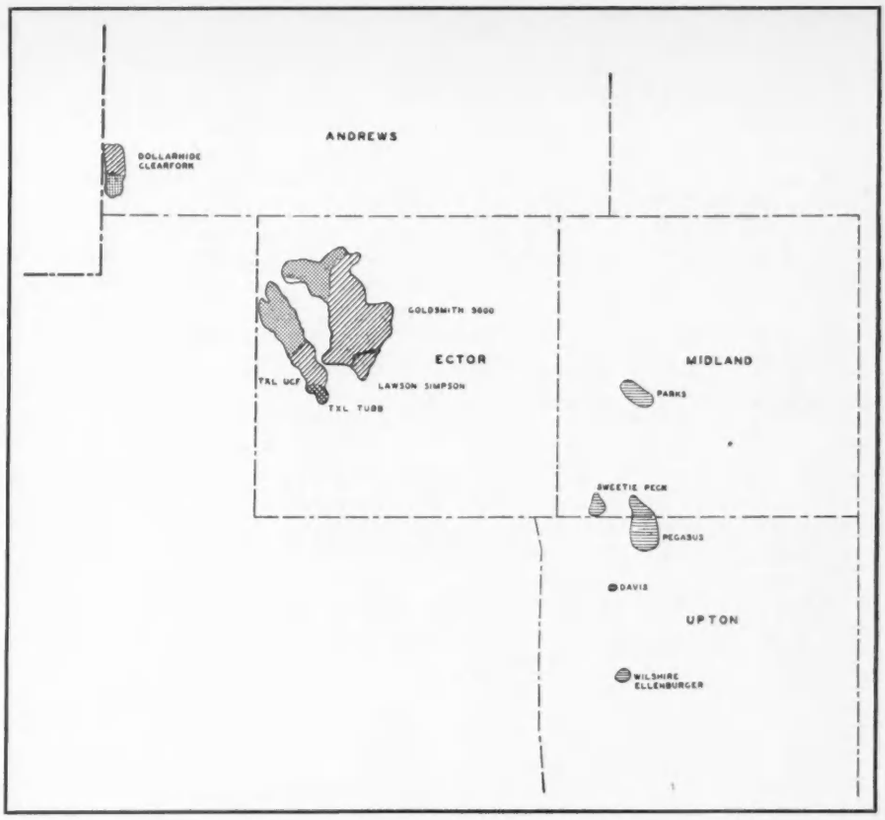
The Pegasus Ellenburger field has been active in the past year with the completion of 35 producing wells. In addition to field locations, the productive limits of the field were extended a mile east and south and a half mile north and west. Pennsylvanian production was discovered in the area early in 1951 with the completion of the Murchison 1 Cannon, 1½ miles north of the nearest Ellenburger producer in the field. Three Pennsylvanian wells have been completed, and the areal extent of this producing horizon is still speculative. In addition to Ellenburger and Pennsylvanian production, Pegasus has future possibilities from 2 Spraberry zones, 2 Wolfcamp zones (one of which has flowed on test), a Devonian zone, and a Fusselman zone. Two important outposts are now drilling in the northern part of the area: (1) Sinclair Oil & Gas Company's Tippett 2, which is 1½ miles northwest of the present Pennsylvanian production; and (2) Sinclair's Tippett 3, located 1½ miles north of present Ellenburger production.

Sweetie Peck

The Sweetie Peck field has developed rapidly in the last year with the completion of 20 producers. The greater number of these completions were in the Pennsylvanian and Ellenburger horizons. The field now covers approximately four square miles. The northern productive limit of the Ellenburger probably was established with the recent completion of Sinclair Saunders 7. This well is 1½ miles

Salient Facts About Important New Fields of West Texas Outside Reef and Spraberry Plays

Field Name	Discovery Date	Discovery Well	Producing Wells 7-1-50	Completions 7-1-50 to 7-1-51	Drilling Wells	Average Depth of Pay	Pay Thickness	Potential Range	Average Daily Allowable	Average Gravity A.P.I.
PEGASUS										
Ellenburger	3- 1-49	Magnolia's TXL A-1	13	35	23	12,300	300	3183- 550	395	53.2
Pennsylvanian	4- 8-51	Murchison's Cannon 1	0	3	..	10,450	50- 80	800- 400	210	44.0
SWEETIE PECK										
Wolfcamp	5- 6-50	Norwood's Peck 1	1	1	4	9,848	44- 80	47- 222	52	58.0
Pennsylvanian	5- 6-50	Norwood's Peck 1	1	12	..	10,342	30-110	233-1283	230	45.2
Devonian	6-16-50	Gen. American's Peck D-1	1	0	..	12,215	175	617	80	48.0
Fusselman	12- 4-50	Benson-Montin's Peck 1-F-DC	0	1	..	12,555	50	241	85	50.0
Ellenburger	2-24-50	Gen. American's Peck 1	1	8	..	13,128	55-122	38-1056	445	53.1
WILSHIRE										
Ellenburger	4-12-51	Sinclair's McElroy Ranch 1	0	1	14	12,008	300	1681	330	53.6
Pennsylvanian	4-30-51	Sinclair's McElroy Ranch 1	0	1	..	9,365	45	288	...	49.8
PARKS										
Pennsylvanian	12- 5-50	Magnolias' Timmerman 1	0	9	4	10,440	50- 60	238- 685	210	44.2
DAVIS										
Ellenburger	11-29-50	Sinclair's Davis 1	0	1	0	13,153	30	174	50	53.6



Some West Texas fields offering significant developments. Numerous horizons are productive in new fields of Midland and Upton counties on the western side of the Midland Basin. Farther west, on the Central Basin Platform, Goldsmith and adjacent fields of Ector and Andrews counties have been greatly expanding in area through development of new Permian pays.

north of Ellenburger production and its initial potential was 38 barrels on the pump. During the year, Fusselman production was added to the numerous other pay horizons with the completion of Benson-Montin Peck 1, a dual Ellenburger-Fusselman producer. Sweetie Peck now produces from the Wolfcamp, Pennsylvanian, Devonian, Fusselman, and Ellenburger horizons.

Parks Pennsylvanian

The Parks Pennsylvanian field was discovered in December, 1950, with the completion of Magnolia Petroleum Company's Timmerman 1. The field has nine producing wells and drilling is still in an exploratory phase. The field is three miles long in a north-south direction, and the northern and southern production is separated by two miles of undeveloped area. Two important step-out wells are now drilling: (1) Magnolia's TXL 1, two miles southwest, and (2) The Texas Company's Scharbauer C-1, two miles east of the field.

Wilshire Ellenburger

The Wilshire Ellenburger field of Upton County became active early in 1951 with the completion of Sinclair's McElroy Ranch 1. This Ellenburger discovery is two miles southeast of the old Wilshire field, and it was 1600 feet high structurally on the Ellenburger to the Wilshire McElroy Ranch 23 which is the only previous producer (Permian) in the area. The McElroy Ranch was originally a dual completion in the Ellenburger and Pennsylvanian. At present the Pennsylvanian horizon is shut in; however, this pay may develop in wells now being drilled in the field. Drilling activity at present is confined to locations near the discovery well. In addition there are two outpost drilling: (1) Sinclair's McElroy Ranch 6, three miles north, and (2) the Greenbrier Windham 1, four miles south of the new Ellenburger production.

Davis Field

The Davis field of Upton County was discovered in November, 1950, with the completion of Sinclair's Davis 1. The field consists of one Ellenburger producer, and it is inactive at this time, awaiting further geophysical and geological study.

The fields of these two counties are on a series of north-south asymmetrical anticlinal structures. These structures are part of a major folded belt which parallels the Central Basin Platform. The folded belt occurs on the eastern side of an off-platform deep in the Midland Basin. The anticlines have steep dipping western flanks into the off-platform deep, while the eastern flanks have a more gentle dip.

The Ellenburger, Devonian, and Fusselman production is confined to the crest of these structures, but the Pennsylvanian strata form broader traps due to thickening over the structures.

Considerable interest should develop in the near future in the northwest along the folded belt trend of the basin. It is probable that similar structures may develop in northwestern Midland, western Martin, and eastern Andrews counties.

Goldsmith Clearfork

Development of Upper Clearfork pay of the Lower Permian in the Goldsmith field in Ector County, Texas, has been a highlight in drilling operations on the Central Basin Platform during 1950 and 1951. Originally discovered as a San Andres producer by the Cascade-Davidson-Atlantic Cummins 1 in 1934, the field has since produced from the Clearfork (1946), Devonian and Ellenburger (1947). The Goldsmith field proper, trending north-south, was proven approximately ten miles in a north-south direction and from 2½ to 5½ miles in an east-west direction by San Andres production. First Upper Clearfork production, commonly called 5600 pay, was secured by Gulf Oil Corporation in C. A. Goldsmith et al. 437. The 5600-foot pay, overlapping the San Andres pay about seven to eight miles in the southern part of the field, further extended the field approximately three miles to the south and 1½ miles to the southwest

over undeveloped acreage.

In October, 1949, E. C. Lawson, A. Borrow et al. 1, Sect. 44, Block 44, T-1-S, T&P was completed as an Upper Clearfork discovery opening the Lawson Simpson field. This discovery stimulated development, and successive wells linked the Lawson Simpson as a 2½-mile southward extension of the Goldsmith 5600 field. In April, 1951, Phillips Adobe 1, Sect. 38, Block 45, T-1-S, T&P proved a link between Goldsmith 5600 and the TXL Upper Clearfork to the southwest, producing since September, 1946. The western limit of the 5600-foot pay may now be the western productive limit of the TXL Upper Clearfork. Defining boundaries of the connecting fields is very irregular, and which field a linking well is drilled in is a question left to the discretion of the operator.

The Upper Clearfork pay consists of numerous thin beds of porous dolomite, interbedded with shale stringers, dense dolomite, and minor sand stringers. Average gross pay varies from 300 feet in the Goldsmith 5600 to as much as 500 feet in the TXL field. Net pay varies locally and is hard to pin down, some pay stringers being only a few inches thick. Average total depth is about 5800. There is no well-defined water table in the Upper Clearfork, although connate water is found in the pay section. Absence of an active water drive is evidenced by the proportionate decrease in water as oil production drops in those wells making water. In the overlapping area of the Goldsmith Clearfork and 5600-foot pay, dual completion methods have been successfully applied. Initial production in the Upper Clearfork pay varies from 51 barrels daily on the pump to as much as 1526 barrels a day flowing through ½-inch choke, depending on local porosity and permeability.

As of July, 466 Upper Clearfork producers had been completed in the three-field area, 339 being in Goldsmith 5600, 104 in TXL Upper Clearfork, and 23 in the Lawson Simpson field. A total of 126 wells had been completed from January 1, 1950, to July, 1951, in the three fields; 111 in Goldsmith 5600; and 10 in Lawson Simpson. In the middle of July, 34 rigs were operating as Upper Clearfork tests in that area, 29 in the Goldsmith 5600. As many proven locations are yet to be drilled, the Upper Clearfork play in that area will undoubtly hold its own as an important development play for the next few years.

TXL

The TXL field in central west Ector County, Texas, was brought in by Shell Oil Company and Cities Service Oil Company's TXL 1 as a Devonian producer in January, 1944. Further development placed it as one of the largest Devonian producing areas in Texas. As new producing horizons were opened, it became one of the more important multiple pay fields on the Central Basin Platform. Ellenburger pay was developed in May, 1945; Upper Clearfork in September, 1946; and Silurian in December, 1946. By 1950 the field, trending north-south, was approximately 11½ miles long and 2½ to 3 miles wide.

In November, 1950, the Tubb section of the Lower Permian was opened up by Texas Gulf Sulphur Company in Woodard 1, Sect. 9, Block 45, T-2-S, T&P. This new pay, between the already producing Clearfork and Devonian, extended the field south approximately two miles past previously defined Clearfork limits. It has not been developed in the main part of the field to the north. Initial production of the discovery was 438 barrels of oil per day flowing through an 18/64-inch choke after a treatment of 6000 gallons of acid. Top of pay was 6158 feet at a plug-back depth of 6996 feet. Water was encountered at approximately 6310 feet.

The Tubb pay has proven similar to the Clearfork pay in the TXL field. Local variations in porosity and permeability apparently are controlling factors in production. Initial production varies from 148 barrels daily on the pump to 753 on a half-inch choke. All wells were acidized. Gross pay averages about 230 feet, depending upon the development of the porous dolomite zone directly below the base of the Tubb sand. The Woodard 1 was completed in a limey dolomite topped about 135 below the base of the sand. The two zones are separated by dense dolomite 50 to 60 feet thick.

Development of the Tubb pay in the TXL field is in its early stages. Thirteen producers had been completed as of July, and three wells were drilling.

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Dollarhide

The Dollarhide multiple pay field in extreme west Andrews County, PSL Blocks A-52 and A-55, has seen considerable development during the past year in Clearfork pay. Devonian production was secured in October, 1945; Silurian in January, 1947; and the Ellenburger in October, 1947. First Clearfork production was attained by Cities Service's No. 1-C-E (1-D-E) Cowden, a dual completion from the Clearfork and Devonian in June of 1949. Tests in previous wells had indicated Clearfork possibilities, and the new opener confirmed them by flowing 492 barrels daily on a 20/64-inch choke. The new pay extended the field a mile north. Previous limit was 4½ miles in a north-south direction and two miles in an east-west direction.

The pay section is typical of Clearfork reservoirs on the Platform. Porosity is developed over the low structure in thin beds of porous dolomite interbedded with dense dolomites and clastics. It becomes better developed on the eastern side of the structure and tightens up to the south and southwest, when the pay section may be high enough above water to produce but lacking in porosity. Production varies greatly as in most Clearfork pays. Initial production ranges from 97 barrels daily flowing on a 14/64-inch choke to 1305 barrels a day on a three-fourth-inch choke. Gross pay averages about 150 feet, but varies greatly from a fraction of that amount to more than twice as much. Top of the pay ranges from 6170 to 6670 feet. Water in the pay section is erratic; thus, no definite water table has been established. A well completed higher in the pay section may have water, while a lower well may evidence no water at all.

Considerable interest has been aroused by a three-fourth-mile west stepout to the Dollarhide by Skelly Oil Company's Mexico J 1, Sect. 32, R-24-S, T-38-E. Commercial production in the Clearfork was evidenced on a five-hour drill-stem test from 6127 to 6250 feet. Recovery was 21 barrels of 36.8-gravity oil in 2½ hours. The well is drilling deeper to test the Ordovician.

By July, 1951, the Dollarhide Clearfork field boasted 56 producers, many of them being dually completed with the deeper prepermian pays. Seven wells were drilling in July.

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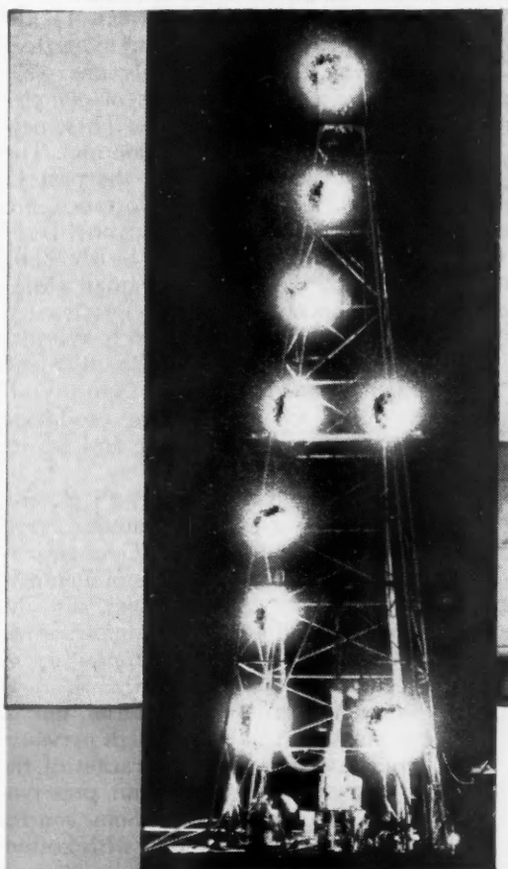

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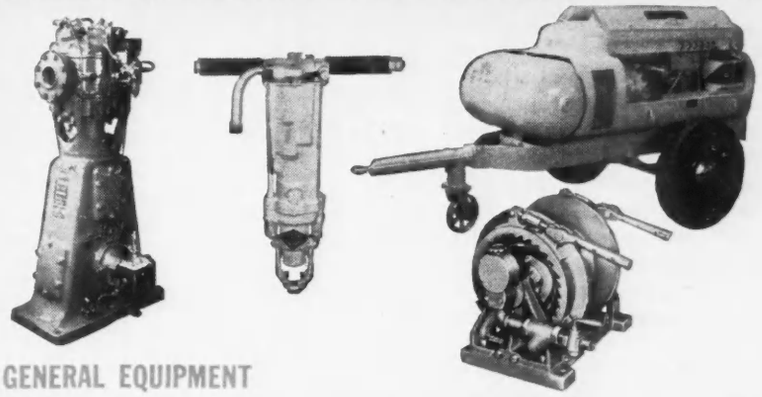

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Pennsylvanian Reef and Non-Reef Development In West Texas

By J. H. BARTLEY
Consulting Geologist, Midland, Texas

THE search for Pennsylvanian production in West Texas has continued at a steady pace during the past 12 months, with discoveries throughout the Eastern Platform, Midland Basin and the eastern flank of the Central Basin Platform. However, none of these discoveries have exhibited the reserves or areal extent of many of the older producing areas in Scurry County (see map). It should be noted that all of these discoveries, except the Rose Pennsylvanian field (northeast Val Verde County), occurred in the "prospective reef trend areas" as shown in the September, 1950, WORLD OIL, West Texas-New Mexico Issue, pages 76-77. it is apparent that additional undiscovered "reef" and "non-reef" type structures still exist in these trend areas, not to mention the probable existence of additional trend areas in the Val Verde Basin and adjacent to the Matador Uplift.

The Pennsylvanian producing areas of West Texas, for purpose of classification, are herein divided into two groups and recognized as "reef" and "non-reef." The "reef" type reservoir represents a limestone buildup which is anticlinal in appearance, with the limestone disappearing laterally into shale, i.e., Kelly-Snyder area (Scurry County); whereas the "non-reef" type reservoir represents a limestone section more or less uniform in thickness, being existent due to primary structural development in older Pre-Pennsylvanian horizons, i.e., Benedum, Big Lake, Susan Peak (Upton, Reagan, Tom Green, and Schleicher counties).

It is apparent that additional subsurface data will make it necessary to subdivide the "non-reef" areas into two groups: (1) "basin non-reef" and (2) "platform non-reef." The "platform non-reef" producing areas are existent due to primary structural development in the immediate underlying Pre-Pennsylvanian beds; i.e., Susan Peak, Tom Green County; whereas the "basin non-reef" producing areas exhibit a limestone section usually separated from underlying Pre-Pennsylvanian beds by a prominent shale section or very poorly developed limestone section; i.e., Glass Pennsylvanian (Midland County), Pegasus Pennsylvanian and Benedum Pennsylvanian (Upton County).

During the past 12 months, 29 new producing areas have been discovered (see table) in addition to the previous 62 producing areas, giving a total count of 91 producing areas in the West Texas area as of September 1, 1951, an increase of 47 percent. Of the 29 new producing areas, 14 are developed pools containing more than one well, 12 contain only one well, and 3 are in the process of completion as wildcat discoveries. These new fields are in 18 different counties. The major discoveries during the past 12 months, in order of importance, are the South Brownfield Canyon (Terry County), Hulldale (Schleicher County), Parks Pennsylvanian (Midland County), Pegasus Pennsylvanian (Midland-Upton counties), Wilshire Pennsylvanian (Upton County) and Double Mountain (Stonewall County). Of the 29 new producing areas, 16 are "reef" type and 13 are "non-reef" type.

Pennsylvanian Producing Areas Discovered During 12 Months Period, Sept. 1, 1950-Sept. 1, 1951

COUNTY	*FIELD NAME	TYPE
Andrews	Reed Penn.	Non-reef
Borden	East Gail (T)	Reef
Borden	South Reinecke (T)	Reef
Borden	East Reinecke (T)	Reef
Crockett	Clara Couch Penn. (T)	Reef
Dawson	East Sparenburg	Non-reef
Fisher	Hinerman	Reef
Gaines	Chilton-Penn. (T)	Non-reef
Gaines	Robertson Canyon	Non-reef
Garza	Tobe Strawn	Reef
Garza	Spur Canyon	Reef
Howard	Bond Canyon	Non-reef
Howard	Vincent Penn.	Reef
King	E. Bateman Ranch	Reef
Martin	Glass Penn.	Non-reef
Midland	Bauman Penn.	Non-reef
Midland	Parks Penn.	Non-reef
Midland	Timmerman	Non-reef
Midland-Upton	Pegasus Penn.	Non-reef
Nolan	Featherstone	Reef
Schleicher	Hulldale	Reef
Schleicher	Hulldale North	Reef
Schleicher	Mittel (T)	Reef
Scurry	West Cogdell	Reef
Stonewall	Double Mountain	Reef
Terry	South Brownfield	Reef
Upton	Jigger-Y	Non-reef
Upton	Wilshire Penn.	Non-reef
Val Verde	Rose Penn.	Non-reef
Total 18 Counties	16 Fields	Reef
	13 Fields	Non-reef
Total	29 Fields	

* Names marked (T) are temporary names.
Penn. denotes Pennsylvanian.

Relative to the "non-reef" (basin) type discoveries, the Bauman Pennsylvanian field, Midland County, possibly exhibits a new type of Pennsylvanian reservoir; however, at the present writing, it is impossible to determine the exact composition of the reservoir as to whether it is of limestone or detrital material, due to the fact that extremely high pressures encountered upon penetration of the pay section did not permit preservation of the drill cuttings. Some sources credit the discovery well with bottom hole pressure buildup in excess of 7000 pounds per square inch.

The development of Pennsylvania sand production has become most prominent in the Cogdell (Kent and Scurry counties), and North Snyder portion of the Kelly-Snyder (Scurry County) fields. The producing sands occur above the limestone "reef" section, and in many instances are highly productive. The presence of these younger Pennsylvanian sand deposits relative to "reef" and "non-reef" producing areas should add tremendous value to their potentialities as future undeveloped reservoirs, and their presence should be fully evaluated by the drill stem during process of exploration for Pennsylvanian and/or deeper production.

(See map on 144-145.)

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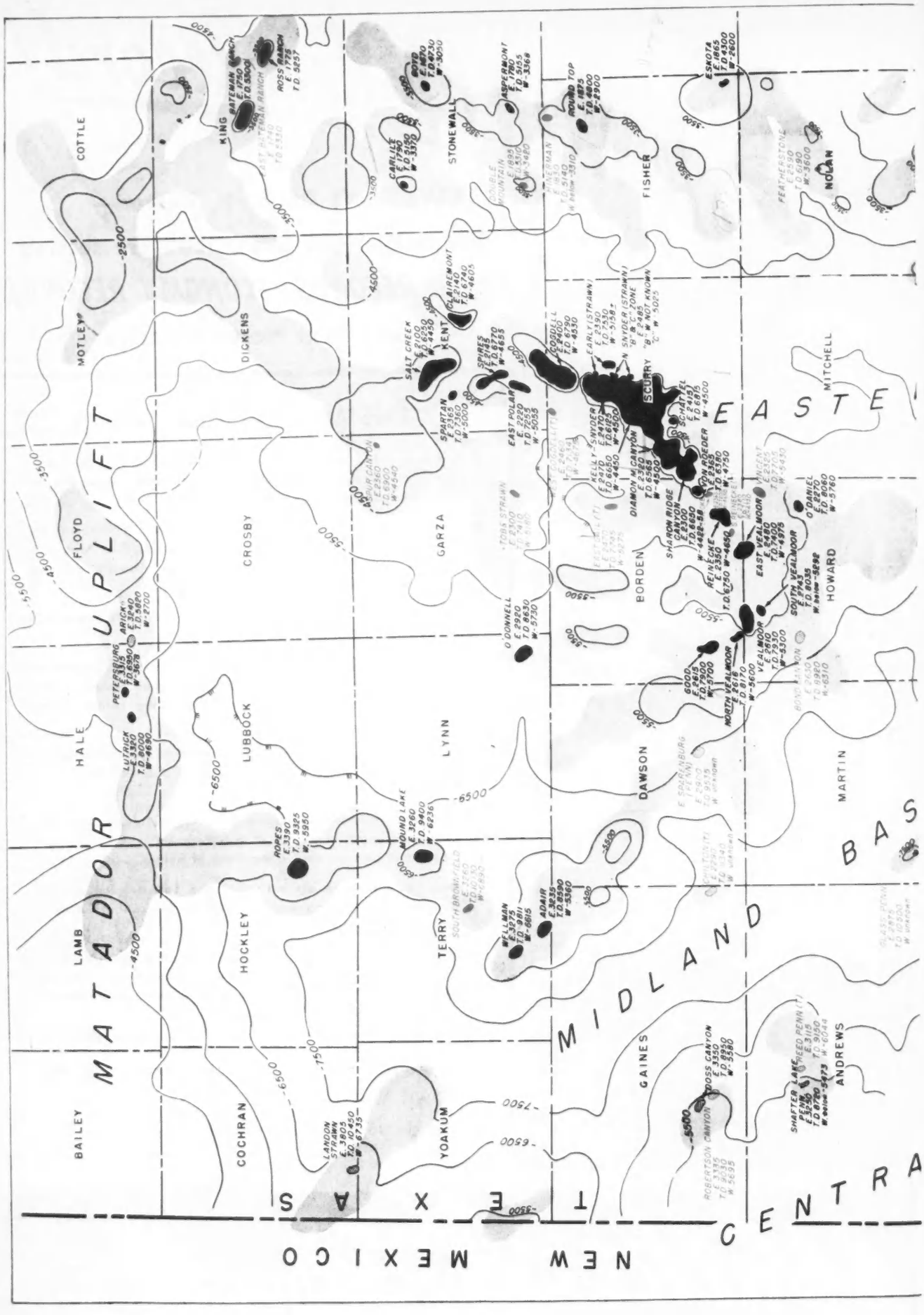
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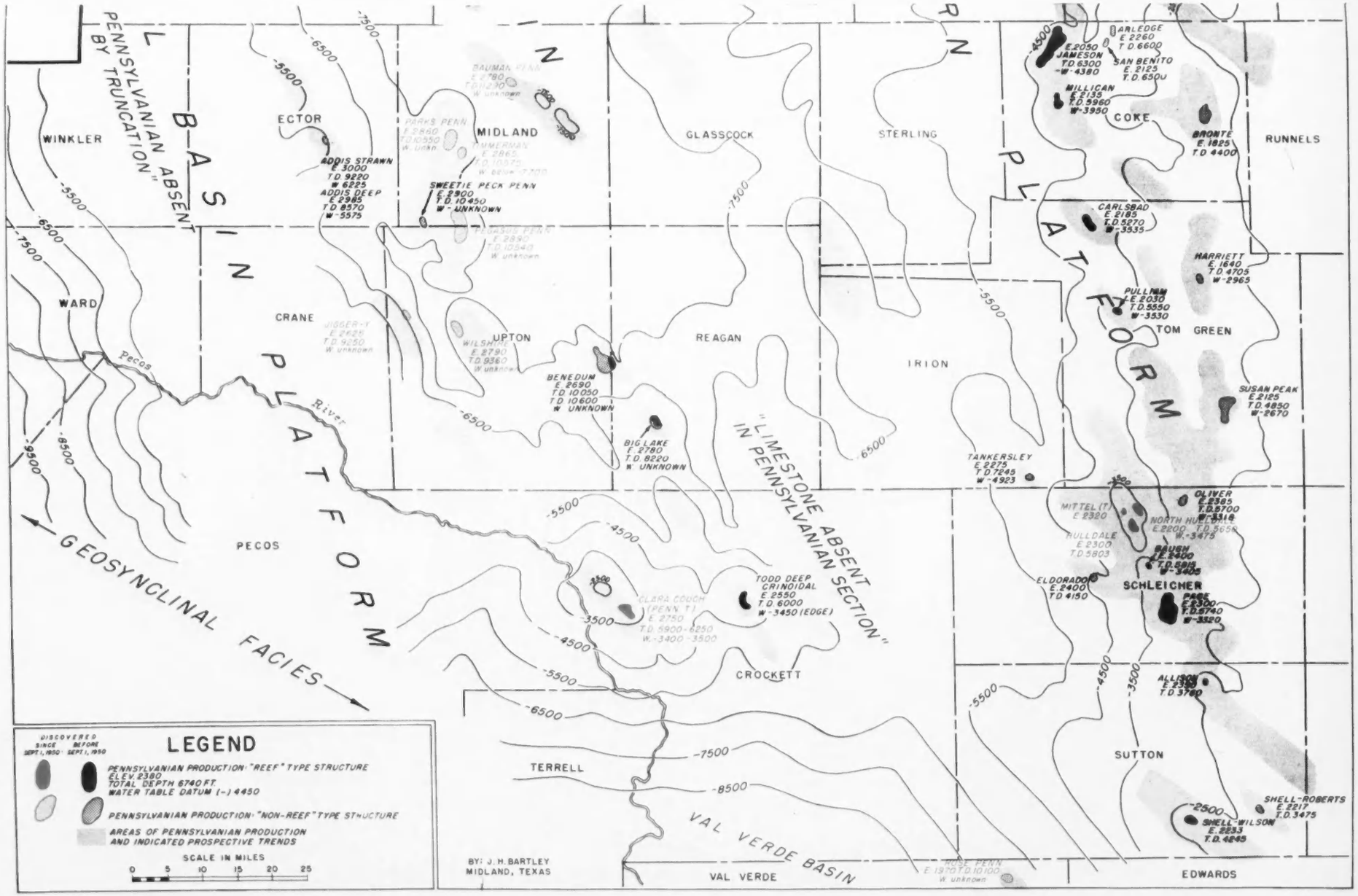
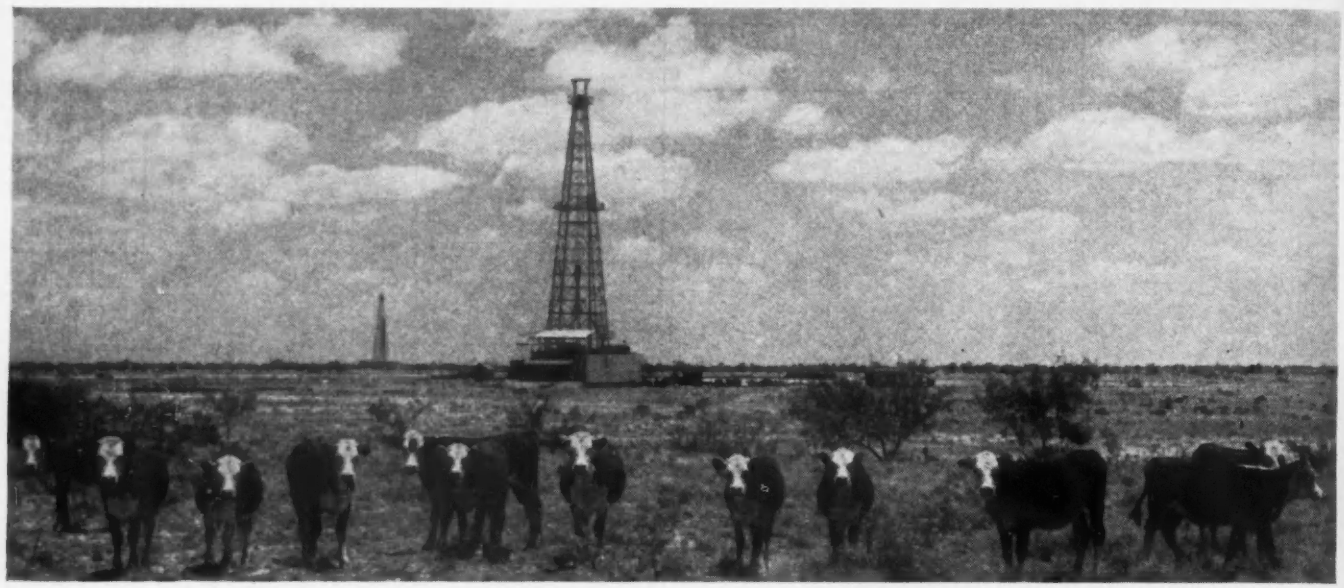


Regional Pennsylvanian Subsurface Structure Map of West Texas Permian Basin

Contours on top of Pennsylvanian limestone. Contour interval: 1000 feet. Full-scale copies of this map in original size, 32 by 45 inches (1 inch equals 6 miles), are available from author of accompanying article, J. H. Bartley, Consulting Geologist, 206 East Wall Street, Midland, Texas.



Pre-Permian Pays Productive In New Mexico's New Fields

By GLENN STALEY
Director, New Mexico Oil and Gas Engineering Committee, Hobbs

FORMATIONS older than Permian have occupied major interest on the New Mexico side of the Permian Basin during the past 12 months. Wells drilled to the Devonian formation, below 11,000 feet, in the northern part of Lea County have developed some very prolific pays. The Pennsylvanian and Mississippian formations also have been tested and proven for production.

Chaves, Eddy and Roosevelt Counties also have had a number of deep tests, and a couple of promising exploratory tests are in the process of completion.

Fifteen new pools were discovered during the last 12 months, and there are 25 wildcats drilling. There are 140 wells being drilled in southeastern New Mexico, as compared to 120 at this time last year. Approximately 60 percent of wells being drilled are tests to formations older than Permian. New discoveries and development are as follows:

IN THE NEW MEXICO part of the Permian basin, development during the past year has placed emphasis on formations older than the Permian, which formerly was the objective of most of the drilling. About 60 percent of the wells now being drilled are Pre-Permian tests.

Chaves County

Twelve or more wildcats have been drilled below 6000 feet in the past 12 months. One well in Twp. 8s-R32e drilled to granite at a total depth of 11,621 feet. In Twp. 7s-R29e a well was drilled to granite at 8731 feet. Both wells were abandoned.

Magnolia Petroleum Company completed O'Brien "B" 1 in 1-19s-28e at a plugged-back depth of 7300 feet in the Devonian with an initial potential of 271 barrels of oil per day through a one-quarter-inch tubing choke with two-inch tubing at 7240 feet. Total depth was 7666 feet.

Eddy County

An average of 40 wells are kept drilling in Eddy County, and a large percentage of them are completed as shallow producers.

One deep well has been completed recently as a dry hole. Continental Oil Company's W. B. Thurman 1 in 11-16s-37e drilled to a total depth of 10,770 feet in Granite Wash and was abandoned.

Lea County

DENTON AREA: On September 25, 1949, McAlester Fuel Company completed J. M. Denton "A" 1 in 11-15s-37e at a total depth of 11,467 feet, with the top of the Devonian pay at 11,257 feet. The well flowed 457 barrels of oil per day on a 12/64-inch choke through casing perforations at 11,325-465 feet.

In the same area on February 24, 1950, The Atlantic Refining Company completed B. C. Dickinson "B" 1 in 12-15s-37e at a total depth of 9429 feet, with the top of the Wolfcamp pay at 9300 feet. The well flowed 177 barrels per day after treatment with 1000 gallons of acid.

At present this is the most active drilling area in southeastern New Mexico. Currently, there are 5 Devonian producers, 5 Wolfcamp producers, and 16 wells drilling. One of the recent completions drilled 1000 feet of Devonian pay.

BAGLEY AREA: This area was discovered by Amerada Petroleum Corporation's State "BTA" 1 in 2-12s-33e on April 16, 1949. The well was dilled to a total depth of 11,766 feet and completed at a plugback depth of 10,990 feet, with the top of the Devonian pay at 10,785 feet. On initial production test the well flowed

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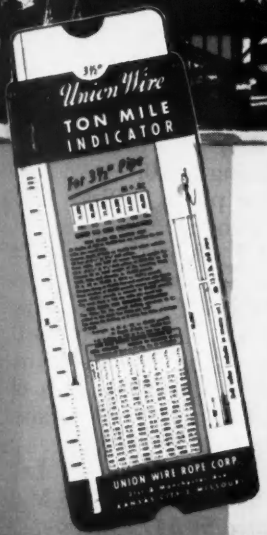

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In the same area Amerada's Caudle 1 in 10-12s-33e was completed as a Pennsylvanian producer, with an initial production of 285 barrels of oil per day on a one-half-inch tubing choke at a plugback depth of 9045 feet.

At present there are 24 producing Devonian wells, 4 producing Pennsylvanian wells, and 6 wells drilling in this area.

SAUNDERS AREA: In 34-14s-33e Gulf Oil Corporation completed Maud Saunders 1 as a producer in the Pennsylvanian pay. The well was drilled to total depth of 13,232 feet and pluggedback to 10,709 feet. On initial production test the well flowed 372 barrels of oil in nine hours through open two-inch from pay at 9865-82 feet after 1000 gallons of acid. Eight Pennsylvanian wells have been completed and eight are drilling.

GLADIOLA AREA: McAlester Fuel completed the discovery well in the Gladiola pool on September 20, 1950. Brownfield "A" 1 in 24-12s-37e was drilled to a total depth of 12,035 feet to the Devonian formation. The well flowed 367 barrels daily with a gas-oil ratio of 40/1 through perforations from 12,004-34 feet after 1000 gallons of mud acid.

In this same area, Sinclair Oil and Gas Company completed Virgil Green 1 in 13-12s-37e as a Wolfcamp producer. The well was drilled to a total depth of 12,192 feet and pluggedback to 9726 feet and completed as a 120 barrels per day pumping well.

One Devonian and three Wolfcamp wells have been completed and four wells are drilling in this area.

LOVINGTON AREA: This area had its initial "deep" well completed March 30, 1951. Tide-water Associated Oil Company drilled State "P" Unit-D 1 in 32-16s-37e to a total depth of 12,572 feet to the Devonian and completed it at a pluggedback depth of 11,205 feet in the Strawn formation of the Mississippian. The well flowed 767 barrels daily through on-half-inch choke from perforations at 11,080-100 feet and 11,130-50 feet after 6000 gallons of acid. One well is drilling in this area at present.

EUNICE AREA: This area embraces Twps. 31 and 22s-R37e. Development in this area has continued with completions in the Simpson and Ellenburger formations of Ordovician age. During the past 12 months there have been 30 Ellenburger and ten Simpson wells completed.

New Mexico Engineering Group Dates From 1930

The New Mexico Oil and Gas Engineering Committee, of which the author, Glenn Staley, is director, had its beginning in June, 1930, when representatives of all oil companies operating in the Hobbs Pool met and entered into a voluntary agreement to form an engineering subcommittee, composed of a representative of each operator in the pool.

In 1935, the scope of the organization was increased to include all oil producing pools in Lea County, New Mexico, and the name of it was changed from "Hobbs Pool Proration Committee" to "Lea County Operators Committee."

The area covered by the engineering subcommittee reports gradually was increased until in 1950 the Engineering and Statistical Reports covered the entire state. As a result, the name of the organization was changed to "New Mexico Oil and Gas Engineering Committee." At the present time the committee has 112 members. As of July 1, 1951, there were 6020 producing oil wells and 531 gas wells in New Mexico.

There are seven wells drilling in this area.

Roosevelt County

This county, which lies north of Lea County, had its first oil discovery in the early part of 1951, when Magnolia Petroleum Company completed J. B. Brown 1 in 7-7s-34e at a pluggedback total depth of 8163 feet in the Pennsylvanian. The initial production was 175 barrels daily through one-quarter-inch tubing choke on two-inch tubing set at 8140 feet. This well was drilled to a total depth of 9067 feet to the Pre-Cambrian.

Four wells are being drilled in this county.

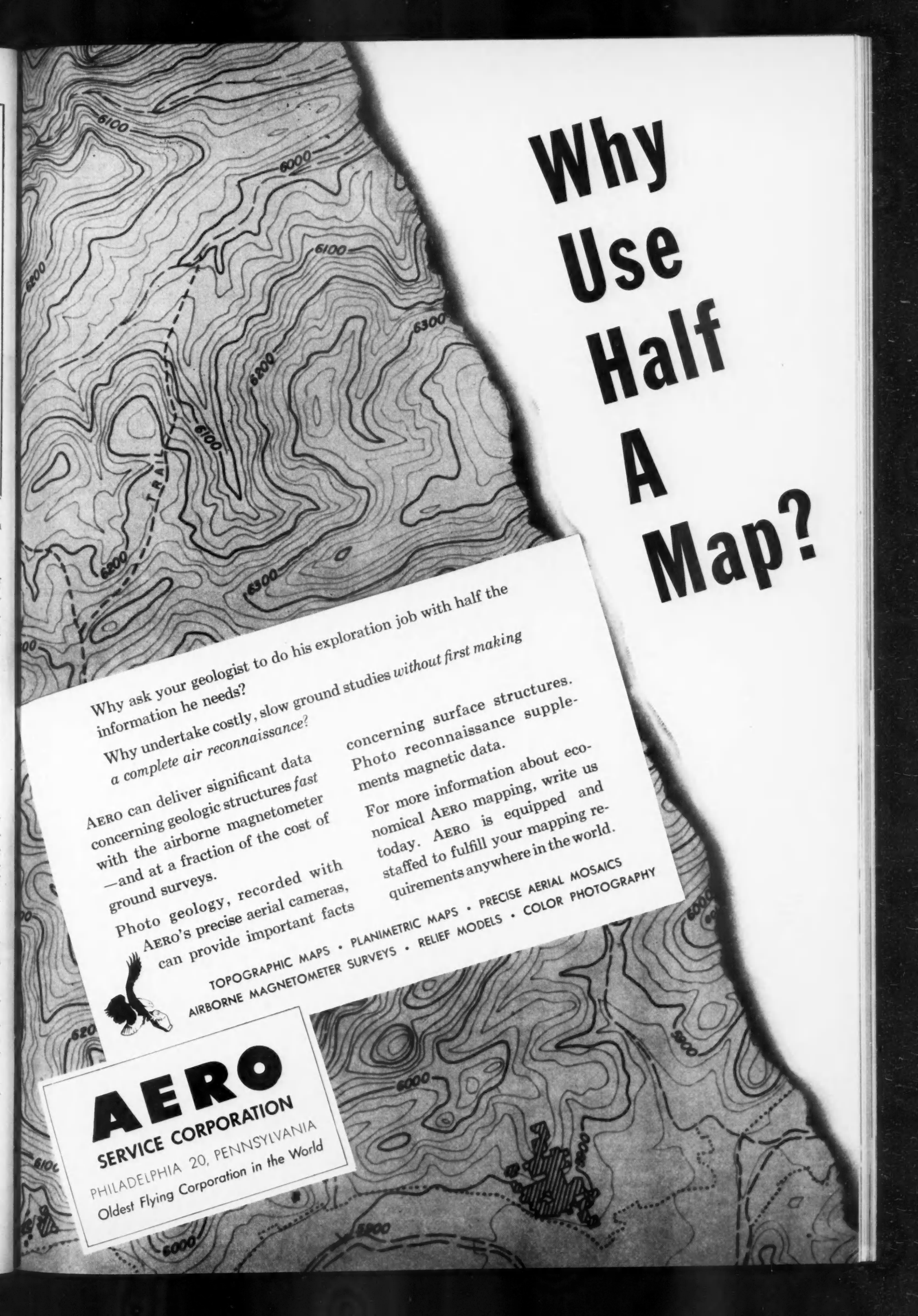
1950 Output

During 1950 southeastern New Mexico ran an average of 3,919,454 barrels of oil per month to the pipe lines for a total of 47,033,453 for the year. In addition, 45,435 barrels of distillate was run from wells classed as gas wells.

Also 161,291,021 Mcf of Casinghead gas and 42,579,847 Mcf of dry gas (gas well gas) was produced in Lea County during 1950.

Eleven gasoline plants in Eddy and Lea Counties processed a total of 175,748,033 Mcf of gas, of which 40,074,034 Mcf was sold to carbon black plants, 93,230,553 Mcf to pipe lines, and 2,715,045 Mcf was used in repressuring. The 11 gasoline plants produced 3,491,033 gallons of gasoline, 1,337,403 barrels of butane, and 601,557 barrels of propane.

Five carbon black plants in Lea County used a total of 55,014,363 Mcf of gas to produce 99,547,216 pounds of carbon black.



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Exploration 21.8 Percent Ahead of 1950 Period

THE second highest number of exploratory tests completed during a single month were recorded during July. A month earlier the all-time high had been reached, and that high drilling activity boosted the year's total wells to a substantial lead over the last year's record-breaking operations.

During July, 981 tests were completed, which was second only to the peak of 997 wells credited to June. However, the more recent month failed to live up to the success of its predecessor, as 155 of July's wells were completed as producers for a score of 15.8 percent, while a month earlier 200 successful wells accounted for 20.1 percent of the total drilled.

The month's discoveries included 112 new oil pools consisting of 91 new fields and 21 new pays in older areas. Six distillate finds were recorded with new fields making one-half of them, and gas discoveries totaling 18 rounded out the month's results.

So far this year 5767 wells have been completed, and they lead the 4736 drilled in the same period of last year by 1031 wells or 21.8 percent. That makes the current program the most active in history, for the previous record-holder was 1950.

Summary of Results of Exploratory Drilling

ITEM	July, 1951	June, 1951	SEVEN MONTHS: January-July 1951	1950	Percent Diff.
Oil Discoveries	112	136	755	621	+ 21.6
New Fields	91	103	554	456	+ 21.5
New Pays	21	33	201	165	+ 21.8
Distillate Discoveries	6	9	50	50	.....
New Fields	3	6	34	40	— 15.0
New Pays	3	3	16	10	+ 60.0
Gas Discoveries	18	30	119	78	+ 52.6
New Fields	17	25	96	70	+ 37.1
New Pays	1	5	23	8	+187.5
Total Discoveries	136	175	924	749	+ 23.4
Extensions to Fields	19	25	163	194	— 16.0
Oil Fields	18	21	124	172	— 27.9
Distillate Fields	.....	1	11	7	+ 57.1
Gas Fields	1	3	28	15	+ 86.7
Total Prod. Tests	155	200	1,087	943	+ 15.3
Dry Holes	826	797	4,680	3,793	+ 23.4
Wildcats	792	773	4,444	3,659	+ 21.5
New Pays	3	1	9	6	+ 50.0
Outposts	31	23	227	127	+ 78.7
Total Expl'tory Tests	981	997	5,767	4.736	+ 21.8
Percent Productive	15.8	20.1	18.8	19 9	.....
Percent Dry	84.2	79.9	81.2	80.1	.....

Results of Exploratory Drilling in July and First 7 Months, 1951-1950, by Districts

State or District	MONTH OF JULY, 1951													FIRST SEVEN MONTHS, 1951															
	Productive Tests									Unproductive Tests			Total Exploratory Tests	Productive Tests								Total Productive		Unproductive Tests			Total Dry		Total Exploratory Tests	
	New Fields			New Pays			Extensions			Total Productive				New Fields			New Pays			Extensions									
	Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas		Wildcats	New Pays	Outposts		Oil	Dis.	Gas	Oil	Dis.	Gas	Oil	Dis.	Gas	7 Mo. 1951	7 Mo. 1950	Wildcats	New Pays	Outposts	7 Mo. 1951	7 Mo. 1950	7 Mo. 1951	7 Mo. 1950
Alabama																	1			2			3	2	9			9	12	12	14
Arizona																							2		2			2	3	2	3
Arkansas			1	1						2	12		14	3		1	7			2			13	8	50		4	54	54	67	62
California	5			1			3			9	27	1	2	39	18		1	11			7		1	38	33	253	3	25	281	216	319	249
Colorado	1		1							2	9			11	4		3							8	1	60		2	62	25	70	26
Florida											1			1						1					2			2	6	2	6
Georgia																													4		4
Idaho																									1			1	3	1	3
Illinois	3			1			6			10	106			116	14			12			24			50	65	384			384	399	434	464
Indiana	4			2						6	27			33	22			5			2			29	29	185			185	274	214	303
Kansas	17		1	1						19	83			102	94		6	20						120	63	457			457	334	577	397
Kentucky	1						2			3	21			24	9			7			7			23	8	105			105	40	128	48
Louisiana	5	1	1	1			1		1	10	32		3	45	21	3	2	14	2	2	10	1	1	56	56	168	1	12	181	119	237	175
North Louisiana	1			1			1		1	4	22		2	28	10			3	1	2	5	1	1	23	16	107	1	4	112	53	135	69
South Louisiana	4	1	1							6	10		1	17	11	3	2	11	1		5			33	40	61		8	69	66	102	106
Maryland																													1		1
Michigan	2									2	27			29	7		3	1		1	1			13	22	176			176	157	189	179
Mississippi	2									2	12		1	15	6	2		2	1					11	13	68		5	73	89	84	102
Missouri																													3		3
Montana							1			1	5		1	7	1						3			4	3	18		3	21	28	25	31
Nebraska	1									1	7			8	5			1			1		4	11	6	31		3	34	27	45	33
Nevada																										2			2		2	
New Mexico	2			1						3	4		1	8	8		7	4			2		1	22	20	40		7	47	43	69	63
North Dakota	1									1	2			3	1									1		3			3		4	
Ohio											2			2							1		4	5	3	15			15	6	20	9
Oklahoma	4			4			1			9	51			60	40		5	14	2	1	17	2	2	83	99	356			356	284	439	383
Pennsylvania			1							1				1			1							1							1	
South Dakota																													2		2
Tennessee											4			4												6			6	4	6	4
Texas	43	2	11	8	3	1	4			72	348	2	21	443	294	29	64	95	11	17	40	8	15	573	499	1989	5	156	2150	1597	2723	2096
Dist. 1 S. Central	2		1							3	12		1	16	14			4	1		1		1	21	11	105		12	117	113	138	124
Dist. 2 Middle Gulf	2				1	1	1			5	21	1	6	33	8	8	11	16	1	8	3	1	4	60	35	113	1	25	139	83	199	118
Dist. 3 Upper Gulf	1	1	3							5	23			28	12	8	13	17	2	2	1	1	2	59	59	160		4	164	129	223	188
Dist. 4 L. Gulf-S.W.	3		2	3	2		2			12	46		3	61	20	6	13	23	6	5	5	1	5	84	61	204	1	22	227	171	311	232
Dist. 5 E. Central							1			1	18			19	3	2		2			5			12	4	102		2	104	40	116	44
Dist. 6 Northeast	2	1								3	13		1	17	5	2		1			1	5		14	14	47		2	49	49	63	63
Dist. 7-B N. Cent	14		3	1						18	90		2	110	105		14	8			4		2	133	111	532		13	545	357	678	468
Dist. 7-C W. Cent	5			1						6	32			38	33	1	2	3	2		4			45	29	165		4	169	112	214	141
Dist. 8 West	6		1	2						9	35	1	1	46	34		4	12			8			58	86	213	3	13	229	169	287	255
Dist. 9 North	7			1						8	57		7	72	57	2	1	12		2	7		1	82	88	338		59	397	367	479	455
Dist. 10 Panhandle	1		1							2	1			3	3		2							5	1	10			10	7	15	8
Utah											1			1	1									1	1	12			12	5	13	6
Washington																													2		2
West Virginia											1			1				2						2		1			1		3	
Wyoming			1	1						2	10		2	14	6		1	7		1	5			20	12	51		10	61	56	81	68
Total U. S.	91	3	17	21	3	1	18		1	155	792	3	31	981	554	34	96	201	16	23	124	11	28	1087	943	4444	9	227	4680	3793	5767	4736

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U. S. Oil, Distillate and Gas Discoveries and Extensions in July

ARKANSAS—NEW OIL PAY

Union County, Schuler, East field. Curtis Kinard's Bishop 1, C SE SE SE 14-18s-17w, flowed 178 barrels from Cotton Valley sand, Jurassic 6683-86 feet, ¼-inch, completed 7-30-51, TD 7707.

ARKANSAS—NEW GAS FIELD

Johnson County. Pure Oil Company's Low Gap Unit 2, in 33-12n-24w, flowed 0.4-million from Atoka sand, Pennsylvanian 1273-87 feet, completed 7-8-51, TD 2015.

CALIFORNIA—NEW OIL FIELDS

Kern County. California Exploration Company and MacMillan Petroleum Company's Well 27-1, in 27-30s-29e, pumped 102 barrels from Chanac sand, Upper Miocene 4032-4310 feet, 22-gravity, completed 7-17-51, TD 4750.

Salt Creek, West field. Ferguson & Bosworth's Anderson 2, in 19-29s-21e, pumped 23 barrels from Phacoides sand, Miocene 453-496 feet, 21.6-gravity, completed 7-3-51, TD 496.

Un-named field. The Texas Company's George 1, in 23-31s-29e, flowed 142 barrels from Santa Margarita sand, Upper Miocene 6363-6514 feet, 35-gravity, ⅛-inch, completed 7-19-51, TD 6516.

Kings County. Norris Oil Company's Well 115-28, in 28-24s-18e, pumped 25 barrels oil and 130 barrels water from Upper Temblor sand, Middle Miocene 852-892 feet, 12-gravity, completed 7-13-51, TD 893.

Los Angeles County, Newhall-Potrero, Northwest field. Southern California Petroleum Corporation's N. L. & F. 1, in 20-4n-17w, pumped 70 barrels from 8890-8962 feet, 36-gravity, completed 7-6-51, TD 9022.

CALIFORNIA—NEW OIL PAY

Orange County, Brea-Olinda field. General Petroleum Corporation's Tonner 22, in 6-3s-9w, flowed 219 barrels from 4061-4264 feet, 32.6-gravity, 16/64-inch, completed 7-8-51, TD 8789.

CALIFORNIA—OIL FIELD EXTENSIONS

Kern County, Bellevue field. Superior Oil Company's Quinn 21-2, in 2-30s-26e, south extension, flowed 126 barrels from Stevens sand, Miocene 7374-7426 feet, 33.8-gravity, 8/64-inch, completed 7-13-51, TD 10,965.

Monterey County, San Ardo field. Superior's Orradre 6, in 6-23s-11e, ¾-mile northeast extension, pumped 12 barrels from Orradre sand, Upper Miocene 2719-84 feet, 13.3-gravity, completed 7-9-51, TD 2821.

Ventura County, Ventura Avenue field. Lloyd Corporation, Ltd's William Sexton 1, in 20-3n-22w, ½-mile east extension, pumped 35 barrels from 12,645-845 feet, 30-gravity, completed 7-22-51, TD 13,058.

COLORADO—NEW OIL FIELD

Logan County. Plains Exploration Company's Dalke 1, SE SE SW 22-8n-54w, swabbed and flowed 288 barrels from Dakota "J" sand, Upper Cretaceous 5247-5300 feet, TD 5300.

COLORADO—NEW GAS FIELD

Logan County. The Texas Company's D. E. Gould 1, SW SW SW 20-9n-52w, flowed 4-million from Dakota "J" sand, Upper Cretaceous 4639-45 feet, completed 7-8-51, TD 5214.

ILLINOIS—NEW OIL FIELDS

Clay County, Oskaloosa, East field. National Associated Petroleum Company's N. Spiker-Sefton Commission "A"-1, in 7-3n-6e, pumped 297 barrels from McClosky lime, Mississippian 2894-97 feet, completed 7-31-51, TD 2897.

Xenia, East field. W. W. Dayton's G. G. Campbell 1, SE NW SE 11-2n-5e, pumped 45 barrels oil and 24 barrels water from Cypress sand, Mississippian

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2505-28 feet, completed 7-17-51, TD 2535.

Marion County, Exchange, North field. Atlas Drilling Company's E. Sawyer 1, SW SE NW 11-1n-3e, pumped 152 barrels oil and 50 barrels water from McClosky lime, Mississippian 2715-19 feet, completed 7-24-51, TD 2831.

ILLINOIS—NEW OIL PAY

Wabash County, Bellmont field. George Ellison's Fisher Heirs 1, SE NE NE 36-1s-14w, pumped 24 barrels oil and 7 barrels water from Bethel sand, Mississippian 2650-57 feet, completed 7-3-51, TD 2925.

ILLINOIS—OIL FIELD EXTENSIONS

Gallatin County, Inman East, Consolidated field. Coy Oil Company's H. C. Ford 1, in 28-7s-10e, ¾-mile northwest extension, pumped 20 barrels from Waltersburg sand, Mississippian 2097-2110 feet, completed 7-3-51, TD 2112.

Lawrence County, Ruark field. Sanders & Fye's Starkman 1, in 7-2n-12w, 1-mile west extension, pumped 4 barrels oil and 20 barrels water from Waltersburg sand, Mississippian 1603-20 feet, completed 7-24-51, TD 1860.

Richland County, Parkersburg Consolidated field. Calvert Drilling Company's Freeman 1, NE NE NE 21-2n-14w, 1-mile extension, pumped 256 barrels from McClosky lime, Mississippian 3066-84 feet, completed 7-24-51, TD 3101.

Parkersburg Consolidated field. Calvert's J. McVaigh 1, SW SE NE 16-2n-14w, ½-mile east extension, pumped 192 barrels oil and 15 barrels water from Rosiclare lime, Mississippian 3076-89 feet, completed 7-17-51, TD 3133.

Wabash County, Keensburg, South field. White & Vickery's G. Garst 1-B, NE NW SE 34-2s-13w, ¾-mile extension, pumped 28 barrels oil and 2 barrels water from Cypress sand, Mississippian 2391-2406 feet, completed 7-3-51, TD 2408.

Wayne County, Keenville field. N. V. & W. Duncan's Blackburn 1, NE NE SE 29-1s-5e, ¾-mile west extension, pumped 231 barrels from Aux Vases sand, Mississippian 2946-56 feet, completed 7-17-51, TD 2959.

INDIANA—NEW OIL FIELDS

Daviess County, Ireland field. Harry H. Risher's Clarence Burris 1, NW NE NW 11-1n-5w, pumped 25 barrels from Salem lime, Mississippian 970-977 feet, TD 977.

Knox County, Monroe City, Southeast field. J. W. McClurg & P. L. Pitzer's Louis Mize 1, Mil Don 230-2n-8w, pumped 30 barrels from Rosiclare lime, Mississippian 1500-07 feet, TD 1507.

Posey County. Calvert's and Sam Raitman's John W. Spencer & Mrs. A. Vogel 1, SW SW NE 13-4s-13w, pumped 50 barrels from Aux Vases lime, Mississippian 2788-94 feet, TD 2797.

Vanderburgh County, Elliott field. Slagter Producing Company's Russell T. Chandley 1, SW SE SW 35-4s-10w, pumped 54 barrels oil and 30 barrels water from Cypress sand, Mississippian 1884-92 feet, TD 1892.

INDIANA—NEW OIL PAYS

Posey County, Bufkin field. Noah Petroleum Company's Walter Droege 1, SE NW NE 5-6s-12w, pumped 325 barrels from Palestine sand, Mississippian 1718-27 feet, TD 1727.

Solitude field. Indiana Farm Bureau & H. D. Atha's S. A. Reese 1, SE NW NW 18-6s-13w, pumped 350 barrels from O'Hara lime, Mississippian 2876-81, TD 2881.

KANSAS—NEW OIL FIELDS

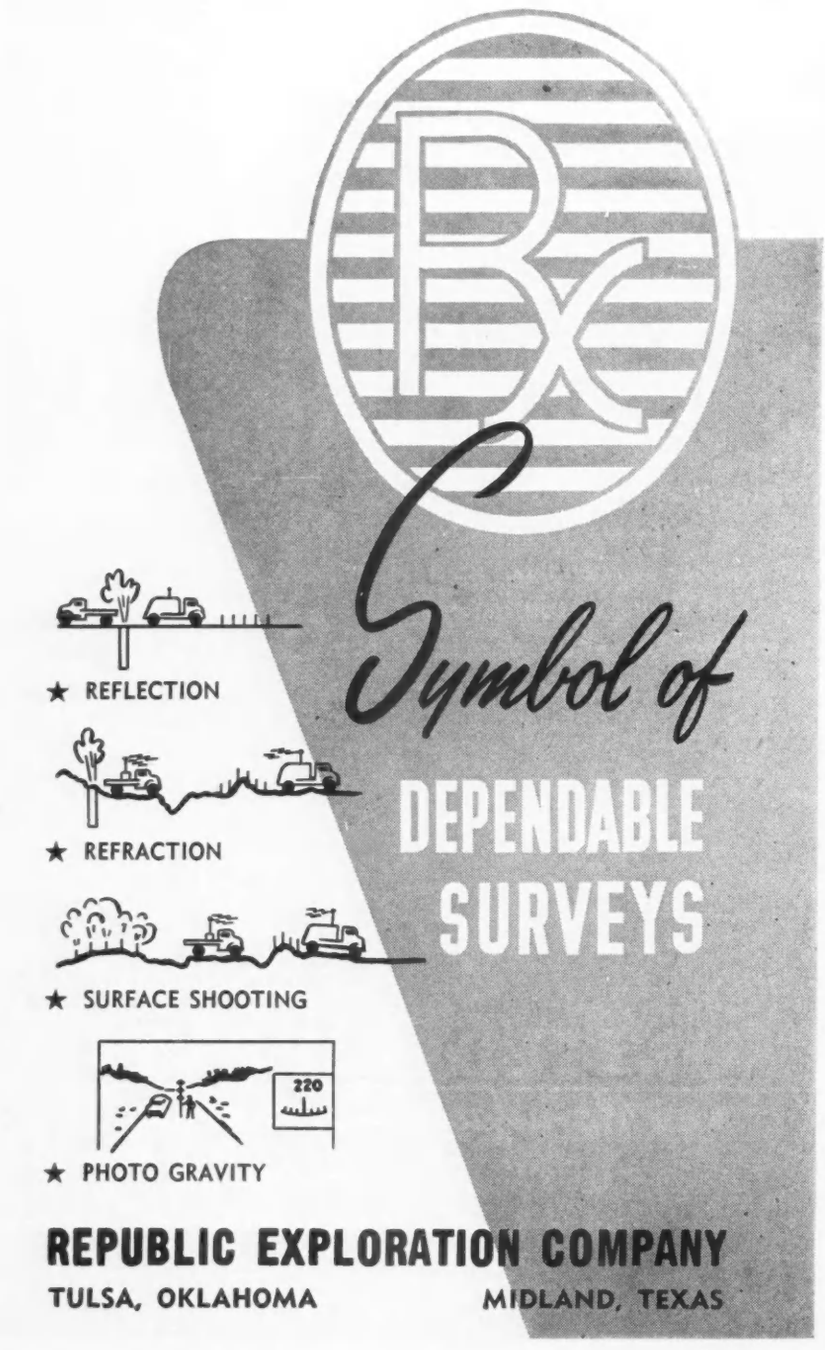
Barton County, Sandford field. Todd Drilling Co. & Derby Oil Company's Sandford 1, SW NW NW 25-17s-14w, pumped 435 barrels from Arbuckle lime, Ordovician 3373-94 feet, TD 3394.

Shoo Fly field. Petroleum, Incorporated's Johnston 1, SE SE NW 9-17s-13w, pumped 401 barrels from Lansing-KC lime, Pennsylvanian 3170-74 feet, TD 3388.

Werner-Robl, South field. W. L. Hartman's Pohlman 1, SW SE SW 30-19s-11w, pumped 50 barrels from Arbuckle lime, Ordovician 2972-80 feet, TD 3351.

Cowley County. K. T. Wiedemann's Lee 1, NW NE SW 16-30s-7e, pumped 20 barrels from Mississippi lime, Mississippian 2889-2917 feet, TD 2917.

Ellis County, Herl field. Lion Oil Company's Herl 1, NW NW SE 28-14s-17w, pumped 133 barrels from Arbuckle lime, Ordovician 3474-88 feet, TD 3488.



Kingman County, Evan Mound field. Bankoff Oil Company's Dieffenbacher 1, SW SW SW 22-27s-5w, flowed 28 barrels from Mississippi lime, Mississippian 3762-3820 feet, TD 3820.

Phillips County, Slinker field. Rine Drilling Company's Slinker 1, SW SW SE 25-4s-20w, pumped 118 barrels from Lansing-KC lime, Pennsylvanian 3215-23 feet, TD 3510.

Stephens field. National Associated Stephens 1, NW NE NE 21-1s-18w, pumped 169 barrels from Lansing-KC lime, Pennsylvanian 3382-87 feet, completed 7-31-51, TD 3482.

Rooks County, Annon field. Derby & Champlin Refining Company's Annon 1, SW SW NE 27-10s-20w, pumped 331 barrels from Arbuckle lime, Ordovician 3708-17 feet, TD 3717.

Russell County. Shumaker & Meyers' Ehrlich 1, NW NW SE 7-14s-13w, pumped 15 barrels from Tarkio sand, Pennsylvanian 2385-2410 feet, TD 2410.

Sedgwick County, Luening field. J. P. Gaty's Luening 1, C S½ NW SE 33-26s-2e, pumped 25 barrels from Simpson sand, Ordovician 3338-56 feet, TD 3372.

Stafford County, Bayer field. Petroleum, Incorporated & Dooley Engineering Company's Bayer 1, SE SE SE 16-21s-14w, pumped 183 barrels from Lansing-KC lime, Pennsylvanian 3560-64 feet, TD 3761.

Dell, East field. Petroleum, Incorporated's Newcome 1, SW SW SW 5-21s-13w, pumped 561 barrels from Lansing-KC lime, Pennsylvanian 3473-81 feet, TD 3651.

German Valley field. Anschutz Drilling Company's Sittner 1, SE NE SW 4-22s-12w, pumped 303 barrels from Arbuckle lime, Pennsylvanian 3647-50 feet, TD 3650.

Oscar, North field. Armer Drilling Company's McBride 1, SE NE SE 14-22s-14w, pumped 883 barrels from Arbuckle lime, Ordovician 3778-84 feet, TD 3784.

Trego County, Ogallah, Southeast field. Stanolind Oil & Gas Company's Monroe 1, SE NW SE 36-12s-22w, pumped 25 barrels from Arbuckle lime, Ordovician 3957-75 feet, TD 3983.

Ogallah, West field. Stanolind's Anderson 1-A, NE NE SE 28-12s-22w, pumped 25 barrels from Arbuckle lime, Ordovician 4044-64 feet, TD 4064.

KANSAS—NEW OIL PAY

Saline County, Salina field. Northwestern Drilling Company's Faith 1, SE NW NW 19-14s-2w, pumped 40 barrels from Viola lime, Ordovician 3207-09 feet, TD 3209.

KANSAS—NEW GAS FIELD

Seward County. J. M. Huber's Lofland-Hawks 1 (OWWO), C SE NW 18-35s-31w, flowed 2.6-million from Morrow sand, Pennsylvanian 5955-6015 feet, TD 8005.

KENTUCKY—NEW OIL FIELD

McLean County, Conner field. George S. Engle's B. O. Warren 1, in 8-N-25, pumped 6 barrels from Cypress sand, Mississippian 2007-2017 feet, TD 2017.

KENTUCKY—OIL FIELD EXTENSIONS

Daviess County, Birk City field. G. L. Reasor's J. B. Thompson 1, in 19-P-27. ½-mile south extension, pumped 200 barrels from O'Hara lime, Mississippian 1909-14 feet, TD 1914.

Henderson County, Robards field. Delta Drilling Company's Maurine Melton 1, in 22-0-23, ½-mile west extension, flowed 70 barrels from McClosky lime, Mississippian 2512-33 feet, TD 2613.

NORTH LOUISIANA NEW OIL FIELD

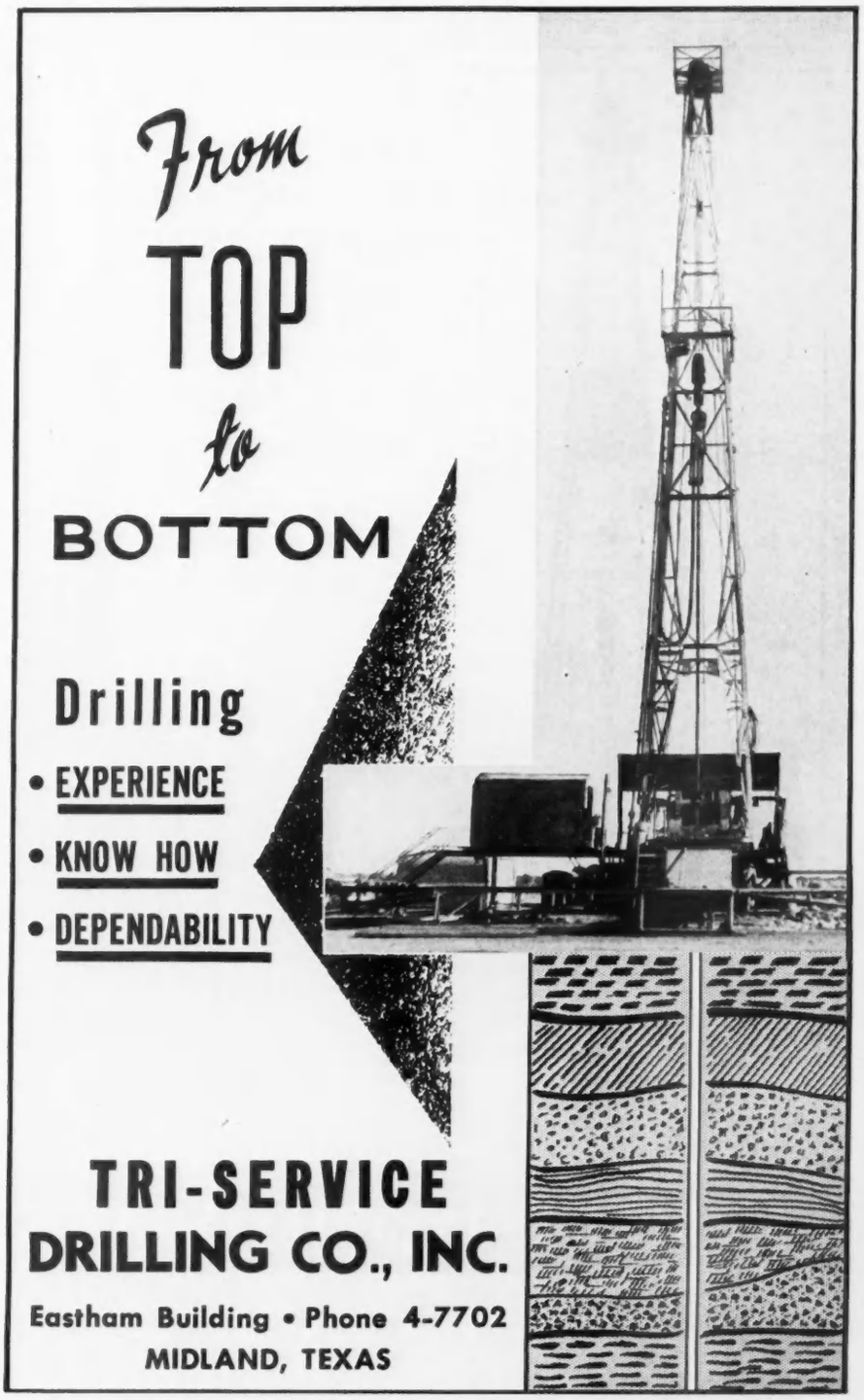
Concordia Parish, "Bayou Cocodrie" field. H. L. Hunt's Fisher Lumber Corporation 2-E, in 15-6n-7e, flowed 187 barrels from Wilcox sand, Eocene 5294-98 feet, 46.7-gravity, 9/64-inch, completed 7-26-51, TD 7003.

NORTH LOUISIANA—NEW OIL PAY

Caddo Parish, Mooringsport field. Burnham & Browning's J. F. Utz 1, in 14-19n-16w, pumped 25 barrels from Pettit lime, Lower Cretaceous 5511-20 feet, completed 7-24-51, TD 5964.

NORTH LOUISIANA—OIL FIELD EXTENSION

DeSoto Parish, Grogan field. Frank L. Collier's Collier-Scurlock 1, in 2-10n-11w, 1-mile southwest extension, pumped 10 barrels from 2971-75 feet, 47-gravity, completed 7-24-51, TD 2984.



NORTH LOUISIANA—GAS FIELD EXTENSION

Richland Parish, Big Creek field. C. M. Bagley's Federal Land Bank 1, C NE SE NE 8-16n-7e, ¾-mile west extension, flowed 45-million from Tuscaloosa sand, Upper Cretaceous 2516-22 feet, open, completed 7-6-51, TD 2749.

SOUTH LOUISIANA—NEW OIL FIELDS

Acadia Parish. Bates & Cornell's Mrs. L. E. Frey 1, in 31-7s-1e, flowed 210 barrels from 9438-46 feet, 24.8-gravity, 9/64-inch, completed 7-31-51, TD 10,143.

Avoyelles Parish, "Bordelonville" field. Sohio Petroleum Company & Pan Am Southern Corporation's Bordelon 1, in 36-2n-5e, flowed 160 barrels from Wilcox sand, Eocene 8407-11 feet, 49-gravity, 14/64-inch, completed 7-24-51, TD 9004.

Beauregard Parish. William Herbert Hunt's Powell Lumber Company 1, in 36-6s-12w, flowed 132 barrels from 8323-30 feet, 42.9-gravity, ⅛-inch, completed 7-10-51, TD 9165.

LaFourche Parish. Humble Oil & Refining Company's Louisiana Land & Exploration Company 1-C, in 30-19s-23e, flowed 269 barrels from 9166-69 feet, 57-gravity, ⅛-inch, completed 7-31-51, TD 13,837.

SOUTH LOUISIANA—NEW DISTILLATE FIELD

Washington Parish. Humble's Gaylord Container Corporation 1-C, in 47-1s-14e, flowed 296 barrels and 6.9-million from Lower Tuscaloosa sand, Upper Cretaceous 9004-10 feet, 49.3-gravity, 22/64-inch, completed 7-17-51, TD 9059.

SOUTH LOUISIANA—NEW GAS FIELD

Orleans Parish. The Texas Company's State-Lake Borgne 1, Lake Borgne, flowed 3.2-million from 7197-7221, 3/16-inch, completed 7-21-51, TD 13,270.

MICHIGAN—NEW OIL FIELDS

Bay County. J. U. Mutch's Demaray 1, SW SE SW 20-18n-3e, Gibson Township, pumped 7 barrels from Dundee lime, Devonian 3090-3120 feet, TD 3157.

Newaygo County. Augie Busk's Hatchew et al 1, SE SW NW 29-12n-11w, Croton Township, flowed 50 barrels oil and 20 barrels water from Traverse lime, Devonian 2548-53 feet, TD 2553.

MISSISSIPPI—NEW OIL FIELDS

Adams County, "Pellucid Bayou" field. R. J. Bartlett & Kemp Drilling Company, Incorporated's Annie T. Minter 1-B, in 52-5n-1w, flowed 105 barrels from Wilcox sand, Eocene 6698-6700 feet, 34.8-gravity, 9/64-inch, completed 7-27-51, TD 7010.

Madison County, Virlillia field. Continental Oil Company's John R. Cameron et al 1, C SE SW 36-10n-1e, flowed 182 barrels oil and 78 barrels water from Hosston sand, Lower Cretaceous 10,559-563 feet, 38.3-gravity, 12/64-inch, completed 7-17-51, TD 14,258.

MONTANA—OIL FIELD EXTENSION

Musselshell County, Ragged Point field. The Texas Company's W. H. Manion 4, NE NW SE 9-11n-30e, 1¼-mile southeast extension, pumped 6 barrels from Heath sand, Cretaceous 3582-3602 feet, TD 4658.

NEBRASKA—NEW OIL FIELD

Cheyenne County, Reimer field. Ohio Oil Company's Reimer 1, NE SE SE 15-17n-50w, pumped 330 barrels from 3rd Dakota sand, Upper Cretaceous 4831-4925 feet, TD 4925.

NORTH DAKOTA—NEW OIL FIELD

Williams County. Amerada Petroleum Company's Iverson 1, C SW SW 6-155n-95w, flowed 303 barrels from Devonian lime, Devonian 10,490-530 feet, 39-gravity, ½-inch, TD 11,955.

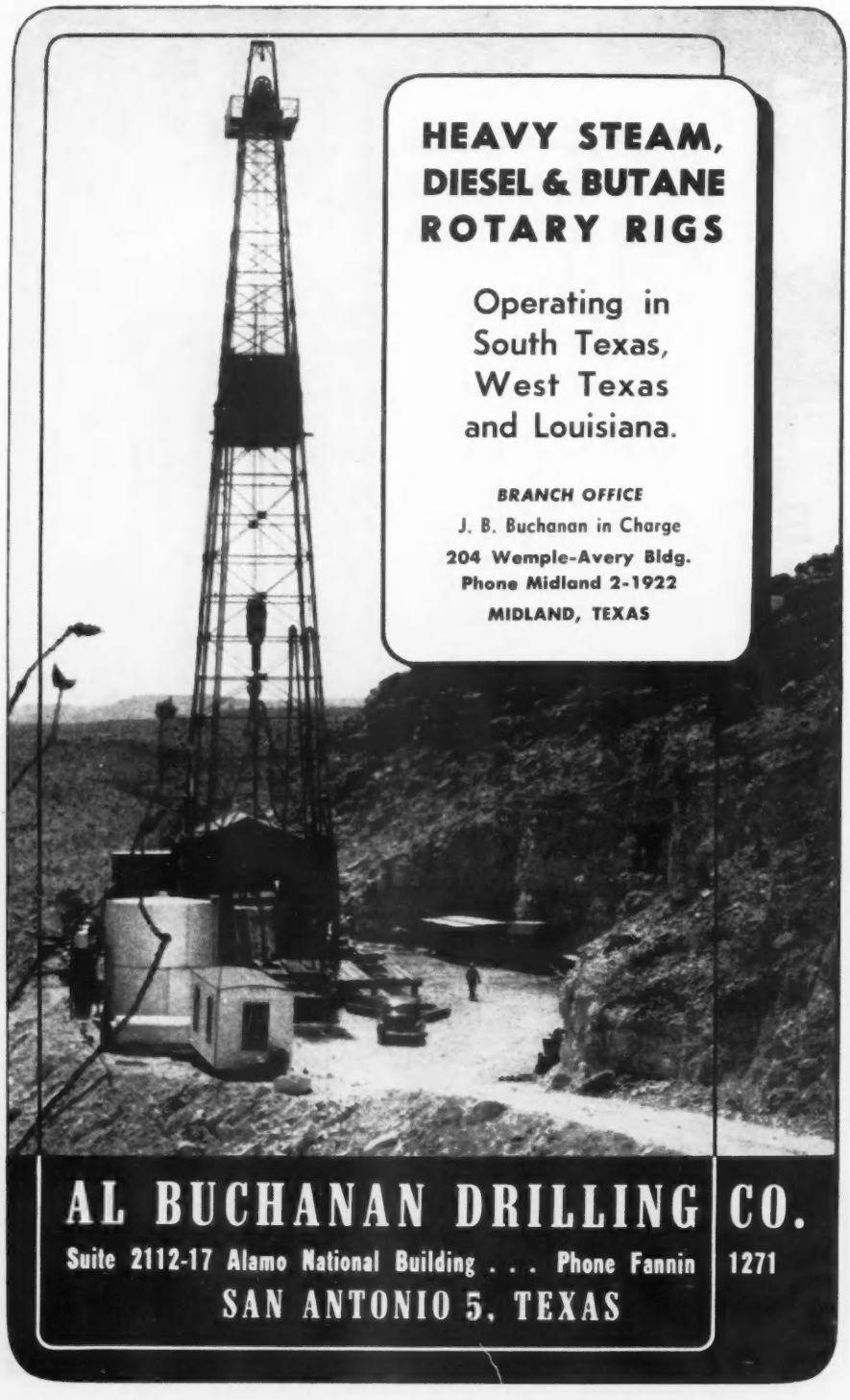
NEW MEXICO—NEW OIL FIELDS

Eddy County. Southern California Oil Corporation's Valley Land Company 1, in 7-24s-29e, flowed 30 barrels oil and 10 barrels water from Delaware sand, Permian 2774-77 feet, 42-gravity, ½-inch, completed 6-19-51, TD 2779.

Rio Arriba County. Thomas W. Doswell et al's Federal-Scott 2, C NW SE 9-26n-6w, flowed 720 barrels from Tocito sand, Upper Cretaceous 6507-6700 feet, 46-gravity, ¼-inch, completed 7-10-51, TD 6700.

NEW MEXICO—NEW OIL PAY

Chaves County, Chisum field. McMillan & Peterson's State 1-A, in 13-11s-27e, pumped 62 barrels from San Andres lime, Permian 2028-56 feet, 21-gravity, completed 7-10-51, TD 2065.



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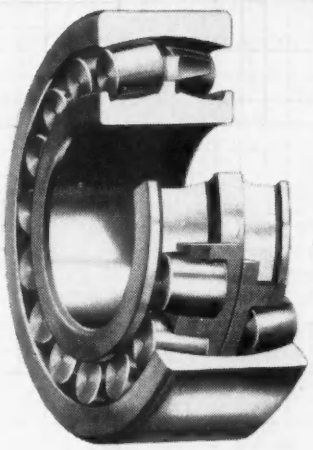

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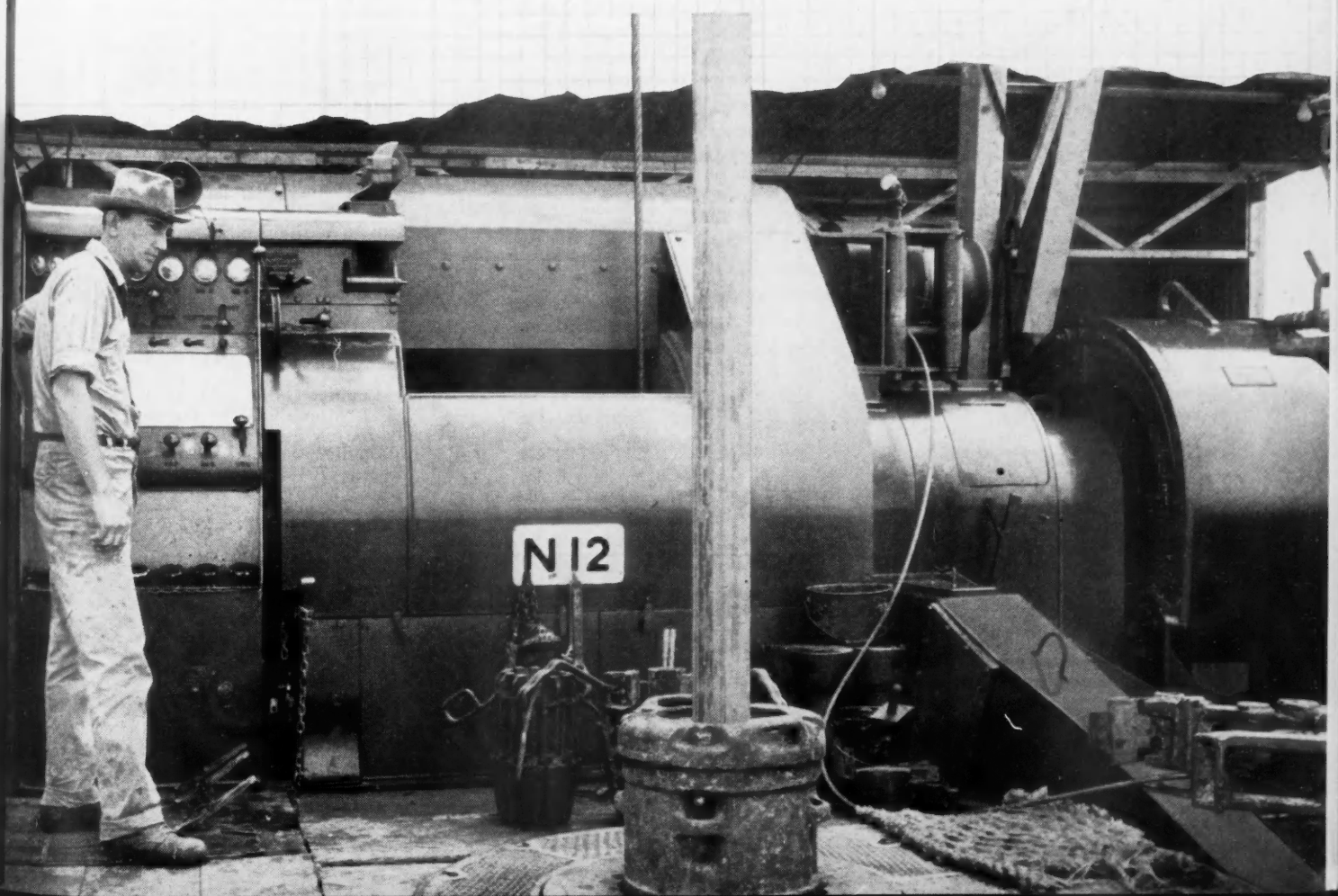

OKLAHOMA—NEW OIL FIELDS

Carter County. Stephens Petroleum Company's Haas 1, NW SE NE 9-2s-3w, flowed 259 barrels from Humphrey sand, Pennsylvanian 6408-51 feet, 43-gravity, 22/64-inch, TD 7227.

Garvin County. The Texas Company's T. A. Smith 1, C NW NW 1-4n-3w, flowed 38 barrels from 2nd Gibson sand, Pennsylvanian 6943-49 feet, 39.5-gravity, 14/64-inch, TD 7237.

McClain County, Noble, west field. Carter Oil Company's N. R. Johnson 2, C SW SE 30-8n-2w, flowed 166 barrels from Oil Creek sand, Pennsylvanian 8967-9010 feet, 35.5-gravity, 7/64-inch, TD 9012.

Pawnee County. Ashland Oil & Refining Company's Eye Bear 1, NW NW NW 35-21n-5e, flowed 21 barrels oil and 60 barrels water from Bartlesville sand, Pennsylvanian 3219-25 feet, 41-gravity, ½-inch, TD 3225.

OKLAHOMA—NEW OIL PAYS

Carter County, Brock, East field. Harper & Turner, & Jones Shelburne's Kirby 1, C SW NW SW 20-5s-1w, pumped 28 barrels oil and 10 barrels water from Basal Hoxbar sand, Pennsylvanian 1966-76 feet, 31-gravity, TD 2114.

Sholem - Alechem field. Stanolind's C. Johnson 1, SE NW NE 4-2s-3w, flowed 59 barrels from Springer sand, Pennsylvanian 5702-24 feet, 35.5-gravity, TD 6800.

Kay County, Doe Creek, Northwest field. Midstates Oil Company's Edna Swan 1, SW SW SE 17-28n-2w, pumped 61 barrels oil and 65 barrels water from Mississippi lime, Mississippian 4200-05 feet, TD 4685.

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Pontotoc County, Jesse field. William Tracktenberg's Helma 1-A (OWWO), NW SE SE 2-1n-7e, pumped 85 barrels from 1281-1300 feet, 34.6-gravity, TD 1606.

OKLAHOMA—OIL FIELD EXTENSION

Lincoln County, Sporn, Southeast field. N. V. Duncan's Frank Kent 1, NE NE SE 28-17n-3e, ½-mile west extension, flowed 120 barrels from Red Fork sand, Pennsylvanian 4034-4300 feet, 40-gravity, 9/64-inch, TD 4300.

PENNSYLVANIA—NEW GAS FIELD

Westmoreland County. Peoples Natural Gas Company's Fred Musnug 1-3921, in Unity township, flowed 7.2-million from Chert Devonian 8003-60 feet, TD 8330.

TEXAS DISTRICT 1—NEW OIL FIELDS

LaSalle County. Henderson Coquat & O. R. Mitchell's Carlos Pena 1, Block 19, I&GN Survey, pumped 36 barrels from Carrizo sand, Eocene 2214-18 feet, 22-gravity, completed 7-27-51, TD 5757.

Wilson County. M. L. Wise et al's Kate Higgins 1, Rafael Salinas Survey, flowed 328 barrels from Austin chalk, Upper Cretaceous 5590-5632 feet, 28-gravity, 12/64-inch, completed 7-4-51, TD 5632.

TEXAS DISTRICT 1—NEW GAS FIELD

McMullen County. Sunray Oil Corporation's A. M. Hostetter 1, Justo Corona Survey, flowed 6-million from Wilcox sand, Eocene 10,088-114 feet, open, completed 7-1-51, TD 10,244.

TEXAS DISTRICT 2—NEW OIL FIELDS

Bee County, "Candlish" field. O. Neathery, Jr. et al's C. C. Diebel 1, Carmen Molina Survey, flowed 66 barrels from 4463-64 feet, 50.5-gravity, ⅛-inch, completed 7-2-51, TD 4512.

Un-named field. T. F. Murchison et al's J. A. Hynes 1 (OWWO), T. Hart Survey, no gauge from 5531-33 feet, completed 6-21-51, TD 5596.

TEXAS DISTRICT 2—OIL FIELD EXTENSION

Goliad County, Berclair field. Husky & New's Berclair School 1, Block 8, Wilkinson Addition to Town of Berclair, 1-mile southeast extension, pumped 47 barrels from Frio sand, Oligocene 2223-33 feet, 22-gravity, completed 7-2-51, TD 2936.

TEXAS DISTRICT 2—NEW DISTILLATE PAY

Bee County, Goree field. H. R. Smith & H. J. Mosser's G. W. Goree 1, Thomas B. Barton Survey, flowed distillate and 30-million cubic feet from Slick sand, Eocene 7014-26 feet, 10/64-inch, completed 7-2-51, TD 7500.

TEXAS DISTRICT 3—NEW OIL FIELD

Orange County. Ohio Oil Company's Lutcher Moore Lumber Company 1, C. L. Higginbotham Survey, flowed 284 barrels from Marginulina sand, Oligocene 7983-87 feet, 40.8-gravity, 12/64-inch, completed 7-3-51, TD 9038.

TEXAS DISTRICT 3—NEW DISTILLATE FIELD

Liberty County, South Dayton field. Gulf Oil Corporation's Mrs. Jessie L. Robin-

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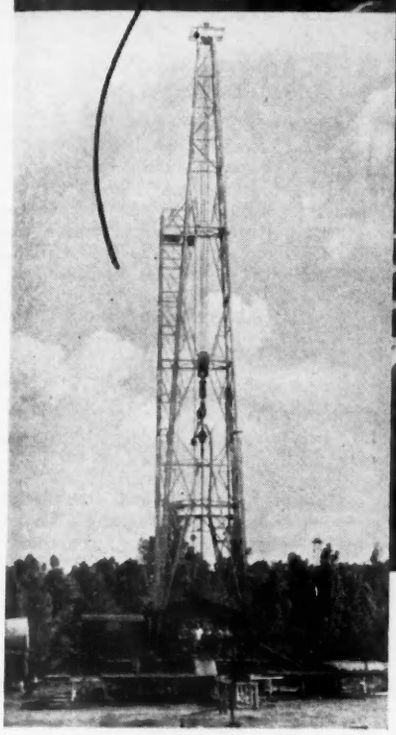

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son 1, William Duncan Survey, no gauge from 8760-9214 feet, completed 7-4-51, TD 9214.

TEXAS DISTRICT 3—NEW GAS FIELDS

Hardin County. American Republics Corporation & Houston Oil Company's J. A. Vickers Fee 1, John A. Vickers Survey, flowed 5-million from 7203-08 feet, completed 6-10-51, TD 7854.

Newton County. Oil Drilling's B. E. Quinn 1, R. K. Richardson Survey, no gauge from Yegua sand, Eocene 7370-72 feet, completed 7-19-51, TD 8770.

TEXAS DISTRICT 4—NEW OIL FIELDS

Duval County. Lundell Brothers' E. C. Lundell 8, J. Poitevent Survey, pumped 32 barrels from Chernosky sand, Eocene 1858-63 feet, 24.4-gravity, completed 7-17-51, TD 1863.

Nueces County, Dagger Island field. Atlantic Refining Company's State Tract 396-1, Corpus Christi Bay, flowed 202 barrels from 7926-46 feet, 40.2-gravity, 9/64-inch, completed 6-28-51, TD 9495.

Un - named field. Sunray's State Tract 351-1, Red Fish Bay, flowed 174 barrels from 7960-72 feet, 42-gravity, 9/64-inch, completed 7-16-51, TD 8714.

TEXAS DISTRICT 4—NEW OIL PAYS

Brooks County, Rachal field. Humble's Lucas Ramirez Estate et al 1 (OWWO), Block 3-A, "La Encantada" Grant, flowed 8 barrels from 4801-06 feet, 45-gravity, ¾-inch, completed 7-14-51, TD 6600.

Nueces County, Dagger Island field. Atlantic Refining's State Tract 398-1, flowed 123 barrels from 7942-58 feet, 40-gravity, ⅛-inch, completed 6-28-51, TD 8252.

San Patricio County, "Miller Ranch" field. Lee Brothers Oil Company's A. A. Miller 1, Block 88, E. J. McGlain Survey, flowed 85 barrels from Frio sand, Oligocene 3693-3704 feet, 26-gravity, 10/64-inch, completed 6-18-51, TD 4654.

TEXAS DISTRICT 4—OIL FIELD EXTENSIONS

Nueces County, Nueces Bay, West field. Phillips Petroleum Company's State Tract 691-1, Nueces Bay, ¾-mile southeast extension, flowed 131 barrels from 5865-70 feet, 39.2-gravity, ¼-inch, completed 7-28-51, TD 10,000.

Starr County, Rincon-Vicksburg field. Continental's M. M. Garcia F-11, Section 542, "F" Lease, ½-mile east extension, flowed 97 barrels from Vicksburg sand, Oligocene 5190-5200 feet, 44.1-gravity, 10/64-inch, completed 7-19-51, TD 5510.

TEXAS DISTRICT 4—NEW DISTILLATE PAYS

Hidalgo County, Sullivan field. The Texas Company's Yturria Land & Livestock Company 1, Porcion 44, flowed 33-barrels and 78-million from 4386-4392 feet, 69-gravity, completed 7-6-51, TD 6715.

Starr County, Rincon field. Continental's M. M. Garcia A-4, (OWDD), CCSD& RGNG RR Survey, flowed distillate and 2.5-million from 7300-15 feet, 65.6-gravity, open, completed 7-8-51, TD 8804.

TEXAS DISTRICT 4—NEW GAS FIELDS

Duval County. Magnolia Petroleum Company's Sinclair Heirs 2, AB&M Survey, flowed 28.5-million from 2165-69 feet, open, completed 6-29-51, TD 3264.

Nueces County, "Knolle" field. Panhandle Producing & Refining Company's Knolle Farms 1, Share 9, Bluntzer Partition, Casa Blanca Grant, flowed 120-million from 5162-72 feet, completed 6-8-51, TD 6250.

TEXAS DISTRICT 5—OIL FIELD EXTENSION

Grayson County, Mulder field. Mid-Continent Petroleum Corporation's O. R. Carson 1, J. Barefoot Survey, ½-mile southeast extension, flowed 165 barrels from Ellenberger lime, Ordovician 7748-78 feet, 43-gravity, 12/64-inch, completed 7-11-51, TD 7844.

TEXAS DISTRICT 6—NEW OIL FIELDS

Wood County. Cliff W. Trice's Four States Oil & Gas Company 1, Hannah Payne Survey, pumped 167 barrels from Woodbine sand, Upper Cretaceous 5665-85 feet, 13.5-gravity, completed 7-6-51, TD 5975.

Un-named field. W. W. Wise's Lillian Mosley 1, W. H. Secrest Survey pumped 67 barrels from Sub-Clarksville sand, Upper Cretaceous 4557-70 feet, 19-gravity, completed 7-10-51, TD 4570.

TEXAS DISTRICT 6—NEW DISTILLATE FIELD

Marion County. Natchez Producing Company & Hollandsworth Oil Company's Dollie Bell Key 1, William Mason Survey, flowed 40 barrels and 75-million from Upper and Lower Pettit lime, Cretaceous 6404-96 feet, 64.9-gravity, open, completed 7-27-51, TD 6565.

TEXAS DISTRICT 7-C—NEW OIL FIELDS

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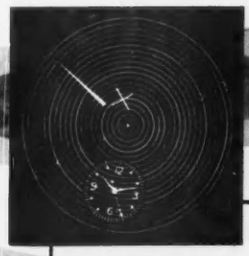

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Shannon A-1, Section 22, Block UV, GC&SF Survey, flowed 2581 barrels from Ellenberger lime, Ordovician 7185-7236 feet, 39.7-gravity, 35/64-inch, completed 7-4-51, TD 7236.

Reagan County. Sunray's B. Sherrod 1-8, Section 8, Block C, LS&V Survey, pumped 141 barrels from Spraberry sand, Permian 6924-7013 feet, 35.4-gravity, completed 7-3-51, TD 7013.

Tom Green County. L. E. Scherck's J .W. Johnson 1, Section 23, WCRR Survey, flowed 165 barrels from Strawn sand, Pennsylvanian 4712-42 feet, 47-gravity, ½-inch, completed 7-17-51, TD 4742.

Upton County, "Jigger-Y" field. Gulf's McElroy Ranch 1-H, Section 169, Block E, CCSD&RGNG Survey, flowed 817 barrels from Upper Pennsylvanian sand, Pennsylvanian 9145-9250 feet, 44-gravity, ¼-inch, completed 7-12-51, TD 12,385.

Un-named field. Humble's V. P. Tippett 1, Section 20, Block 38, T-5-S, T&P Survey, pumped 33 barrels from Spraberry sand, Permian 8160-8210 feet, 38.8-gravity, completed 7-19-51, TD 12,964.

TEXAS DISTRICT 7-C—NEW OIL PAY

Upton County, Flat Rock-Ellenburger field. Cities Service Oil Company & Continental's University 1-AM, Section 32, Block 3, University Lands Survey, flowed 103 barrels from Spraberry sand, Permian 7088-7120 feet, 37.4-gravity, 24/64-inch, completed 7-21-51, TD 11,097.

TEXAS DISTRICT 8—NEW OIL FIELDS

Andrews County. Cities Service's Reed 1, Section 10, Block A-36, PSL Survey, flowed 487 barrels from Pennsylvania lime, Pennsylvanian 9129-34 feet, 38.4-gravity, ½-inch, completed 7-16-51, TD 10,999.

Littman-San Andres field. Neville G. Penrose, Incorporated's Lydia Littman 1, Section 6, Block A-29, PSL Survey, pumped 54 barrels from San Andres lime, Permian 4313-39 feet, 32.7-gravity, completed 7-10-51, TD 4339.

Un-named field. Sinclair Oil & Gas Company's R. A. Cox 1, Section 8, Block A-30, PSL Survey, pumped 138 barrels from Wichita-Albany sand, Permian 7445-95 feet, 41.7-gravity, completed 7-3-51, TD 7600.

Borden County. Lario Oil & Gas Company's T. L. Griffin 1, Section 46, Block 25, H&TC Survey, flowed 310 barrels from Canyon Reef lime, Pennsylvanian 7100-10 feet, 45.8-gravity, 14/64-inch, completed 7-14-51, TD 7110.

Martin County. Pan American Production company's F. D. Breedlove et al 1, League 258, Briscoe CSL Survey, flowed 2341 barrels from Devonian lime, Devonian 12,078-118 feet, 41.3-gravity, ¾-inch, completed 7-19-51, TD 13,053.

Un-named field. Union Sulphur & Oil Company's Snyder & Arnett 1, Section 30, Block 36, T-1-S, T&P Survey, pumped 36 barrels from Spraberry sand, Permian 7184-7245 feet, 34.4-gravity, completed 7-16-51, TD 7245.

Gaines County, Doss-Canyon field. Ralph Lowe's Helen Cunningham 3, Section 4, Block A-24, PSL Survey, pumped 116 barrels from Clear Fork lime, Permian 6300-36 feet, 33.1-gravity, completed 7-12-51, TD 8921.

Midland County, Hi-Lonesome field. The Texas Company's Clearence Scharbauer 1-D, Section 19, Block 39, T-2-S, T&P Survey, flowed 65 barrels from Wolfcamp lime, Permian 9560-9730 feet, 40-gravity, 12/64-inch, completed 7-6-51, TD 10,750.

TEXAS DISTRICT 8—NEW GAS FIELD

Pecos County. Moore & Gilmore & G. H. Vaughn's Stanolind-Grant Estate 1, Section 1½, Block 202, C. W. Johnson Survey, flowed 0.3-million from McKee sand, Ordovician 6670-95 feet, open, completed 7-17-51, TD 6927.

TEXAS DISTRICT 10—NEW OIL FIELD

Hansford County. J. M. Huber Corporation's Man Womble 1, Section 27, Block 3, GH&H Survey, pumped 89 barrels from Pennsylvanian sand 5266-5314 feet, 37-gravity, TD 5416.

TEXAS DISTRICT 10—NEW GAS FIELD

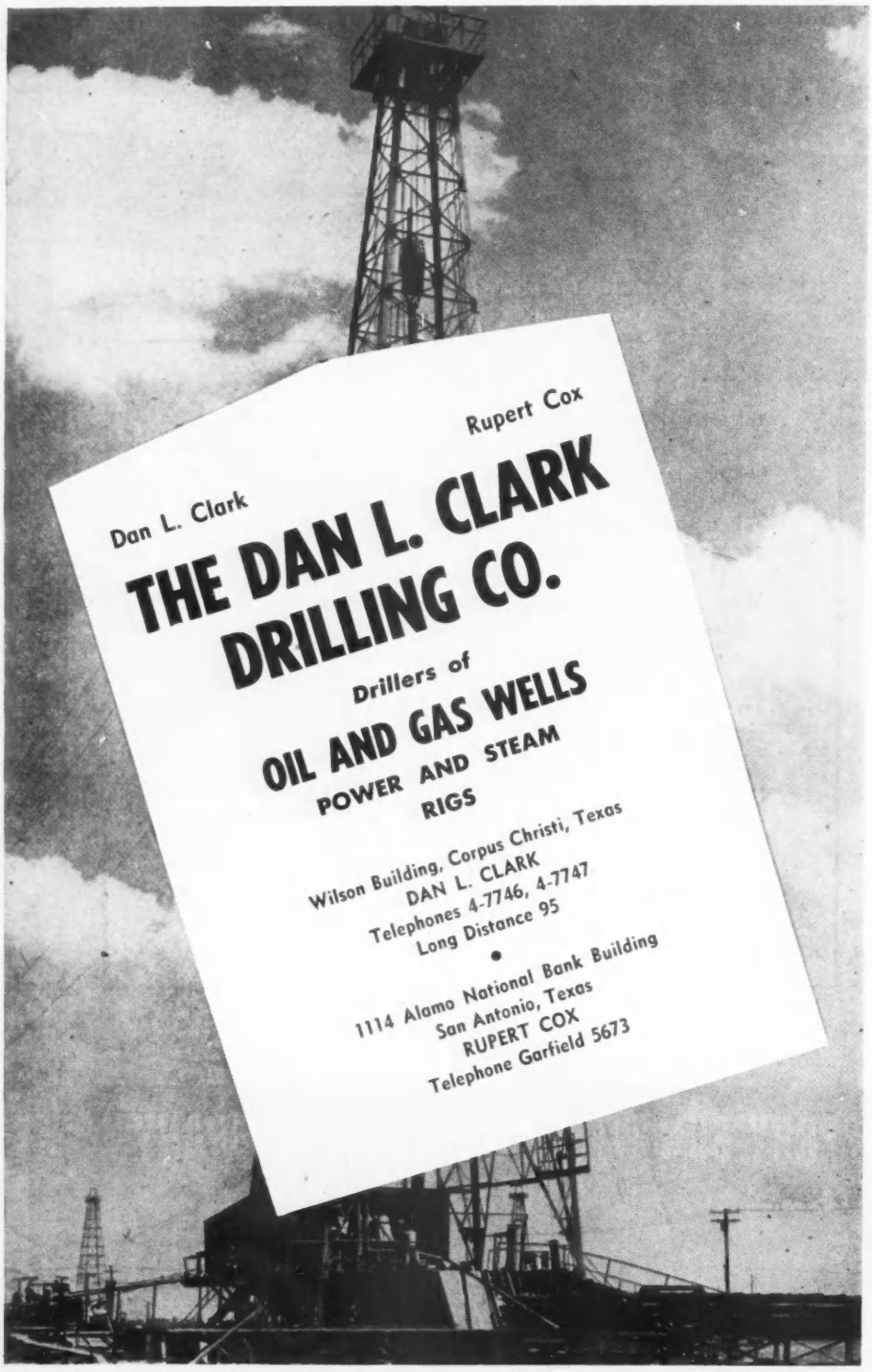
Hansford County. Phillips's Cator 1, Section 33, Block 3, GH&H Survey, flowed 1-million from 5270-5315 feet, TD 7510.

WYOMING—NEW OIL PAY

Fremont County, Beaver Creek field. Stanolind's Unit 15, SE SW NW 10-33n-96w, flowed 226 barrels from Mesaverde sand, Upper Cretaceous 3702-3825 feet, 39.1-gravity, ⅜-inch, completed 7-3-51, TD 3825.

WYOMING—NEW GAS FIELD

Natrona County, Fish Creek field. Atlantic Refining's Government 2 (OWWO) SW NE NE 8-31n-84w, flowed 1-million from Lakota sand, Lower Cretaceous 995-1034 feet, ½-inch, completed 7-31-51, TD 1298.



Drilling Section

W. B. COLVIN, SECTION EDITOR

WORLD OIL

"I get good footage in New Mexico drilling with REED Rock Bits"

REED
Liquid-blast
ROCK BITS

. . . . says I. W. Rogers, drilling superintendent for Makin Drilling Company of Hobbs, New Mexico

FOR GOOD LONG RUNS use the REED 'LB'

REED Liquid-Blast Rock Bits give good, long runs because jets of drilling fluid clean the bottom of the hole. Cutters are always drilling new formation rather than grinding up pieces of formation that are still in the bottom of the hole.

REED ROLLER BIT COMPANY

THE MARK OF QUALITY

HOUSTON 1, TEXAS

Gulf Coast, Mid-Continent, Rocky Mountain and Canadian Distributor for Martin-Decker Products

More Scrap! More Steel!!

AMERICA expects the steel industry to produce more steel this year. More steel requires additional scrap. Steelmakers need the help of all steel users to get every possible extra pound of scrap to meet the nation's call for more steel production. We urge you to do your part. Turn in your scrap through your regular channels.

YOUR SCRAP IS NEEDED — YOUNGSTOWN

The Youngstown Sheet and Tube Company

General Offices -- Youngstown 1, Ohio
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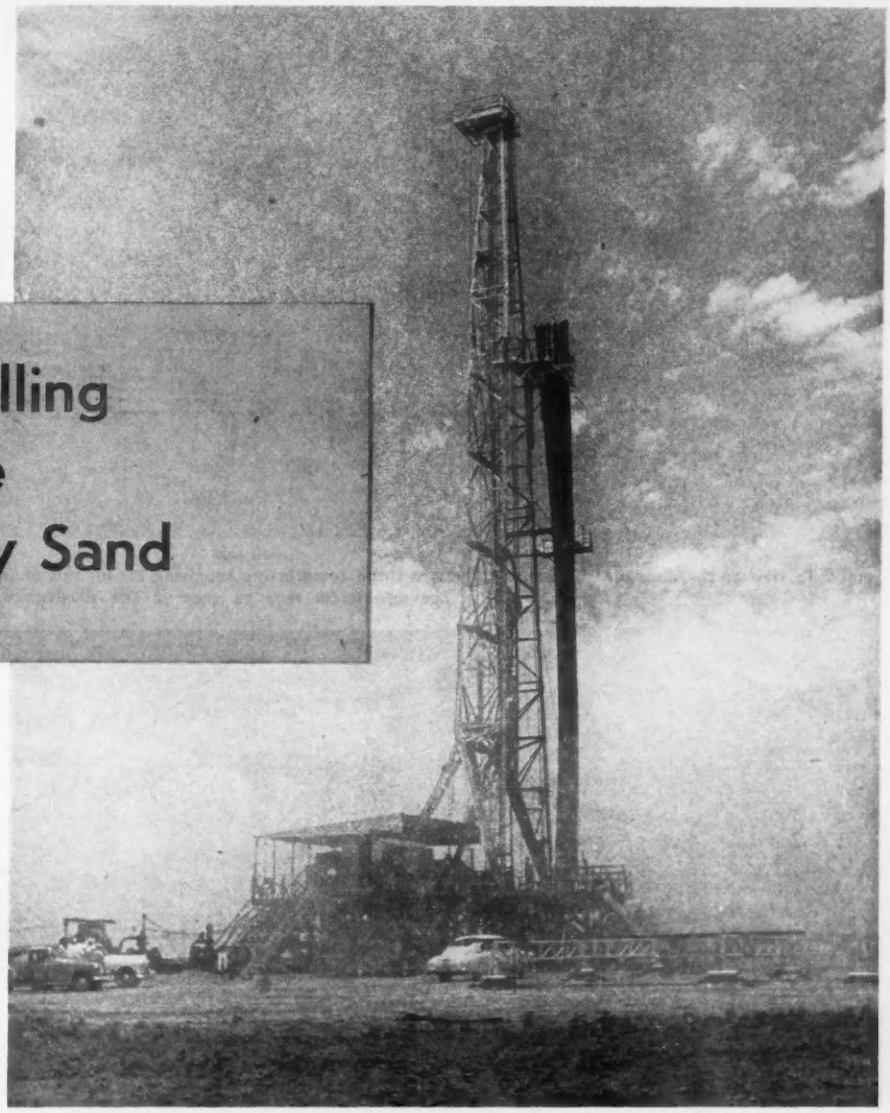
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

By O. H. BERRY
District Petroleum Engineer
Wilshire Oil Company, Inc.

Air Drilling the Spraberry Sand



A change of prevailing winds obscures the Carl B. King Rig 12 with dust expelled from the flow line.

PENNTEX Oil Corporation elected to evaluate the production possibilities of the Spraberry sands in the Ruby Ragland 1 exploratory well, Martin County, Texas, by drilling into the objective formation with a rotary rig circulating compressed air.

This venture resulted in the drilling of 922 feet of formation in the interval 6620-7542 feet at penetration rates of the order of conventional rotary drilling.

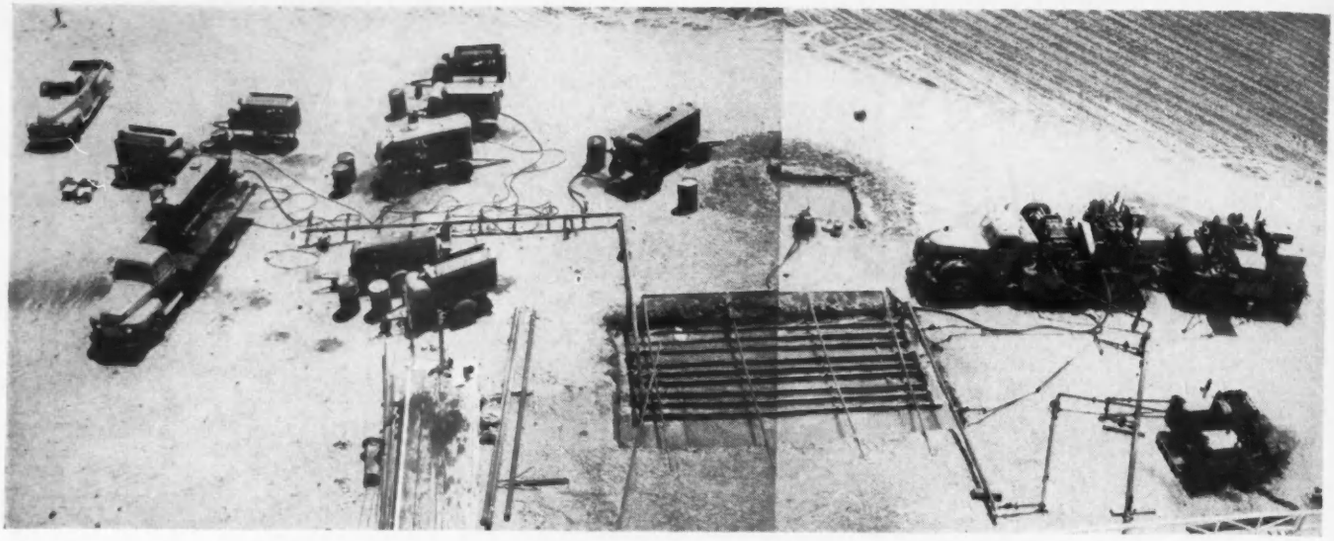
It was believed that this method of drilling into the low-pressure, fractured Spraberry sands held several potential advantages over rotary operations with oil or cable tool drilling. With the former, operators have experienced considerable loss of oil, and with the latter, very slow progress is made at the depths (6000 to 8000 feet) that these sands are encountered. This coupled with the thought that either of these completion methods afforded a certain amount of contamination to the formation, through plastering of the walls with cable tools, and loss of fine cuttings into the formation with oil circulation, suggested the applicability of air drilling. Moreover, air drilling appeared to afford a means of overcoming the difficulty of determining the natural productivity of this particular formation in an unproved area.

Initiation of this experiment stemmed from results obtained by the San Juan Production Company using natural gas in conventional circulation while drilling into a dry gas zone at 4000-5000 feet in the San Juan Basin of New Mexico. Based upon these data and lack of a natural gas supply, Wilshire Oil Company, in the supervisory capacity for Penntex, commenced assembling equipment which would provide a free air volume of the order of 1000 to 1500 thousand cubic feet per day at a maximum stand pipe pressure of 500 pounds per square inch. Selection of compression equipment was limited by availability and the short time element, however, a series of small two-stage compressors commonly used in construction work was contracted together with three larger single-stage booster compressors normally used for compressing natural gas in acidization work. This equipment was tied into a series of manifolds as shown schematically, Figure 1, and was operated to deliver an average air volume of 900 Mcf per day at the indicated pressures and temperatures during drilling.

Surface pressure control equipment consisted of a manually operated master valve, one hydraulically controlled blowout preventer, one hydraulically controlled flow line valve, and a rotating stripper head.

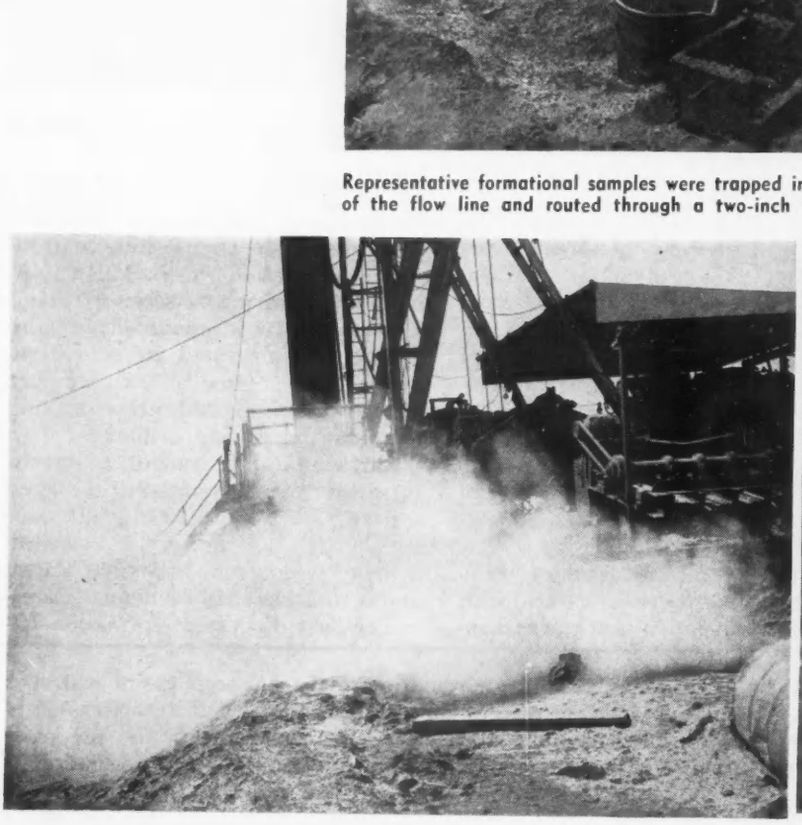
The first 48 feet of formation be-

THE EVOLUTION of rotary circulating media has seen use of water, complex colloids, blended oils, organics, silicates, gas and now air — in limited and specialized application. This article describes the use of compressed air in the penetration of the Spraberry sand, a formation presenting serious lost circulation problems and requiring low pressure completion technique. Although in the experimental stages, the process of air drilling offers a possible solution to similar completion problems.



Composite view of the nine two-stage and three one-stage compressors supplying air for this unusual drilling project. The compressor manifold and cooling system may be seen in the illustration.

Representative formational samples were trapped in the swaged segment of the flow line and routed through a two-inch valve controlled unit.



The introduction of air at an approximate pressure of 500 pounds per square inch and a volume ranging from 1000 to 1500 cubic feet per day resulted in the continual emission of a dust fog from the flow line.

An illustration of Spraberry samples as delivered to surface by reverse circulated air. Samples are smaller than fluid circulated particles, but large enough for interpretation.

low dry seven-inch casing was drilled by conventional circulation of air through a 6⅛-inch jet bit (hard formation rock bit with reduced water course) on 3½-inch drill pipe. Rate of penetration was considered good at approximately 5½ feet per hour with only 4000 to 6000 pounds on the bit and a rotary speed of 35 to 40 revolutions per minute. Returns at the surface, however, were in the form of dust and were valueless from the standpoint of analysis. Also, it appeared that the hole was not being properly cleaned with an air volume of 900 Mcf since, when pulling the bit, there was considerable drag.

Following formation fracturing of the Upper Spraberry, a conventional 6⅛-inch rock bit was run and drilling was resumed using reverse circulation through 3½-inch drill pipe. This proved very satisfactory in maintenance of a clean hole and recovery of formation samples suitable for geological inspection. Drilling by reverse circulation progressed to total depth of 7542 feet. The bit record for the air drilled interval is shown in Table 1. Bit life did not appear abnormal with wear being chiefly in the bearings and outer cutting edges of the cones. Figure 2 (next page) is a radioactive log of the interval drilled.

The major problem encountered during drilling was the accumulation of fine cuttings which adhered to the inner wall of the drill pipe. Apparently, this was due to a small amount of fluid entering the hole. When sufficient fluid was encountered to show a spray at the surface discharge, this difficulty appeared to be alleviated. Therefore, it is believed that in the presence of any appreciable quantity of produced fluid no problem would exist in this connection.

TABLE 1
Rock Bit Record Air Drilled Interval
Ruby Ragland 1

SIZE	Interval	Feet Drilled	Hours	Average Feet Per Hour
6⅛"	6620-6668	48	8¾	5.48
6⅛"	6668-6693	25	2¼	11.11
6⅛"	6693-6754	61	7	8.72
6⅛"	6754-6775	21	2¾	7.64
6⅛"	6775-6808	33	6½	5.07
6⅛"	6608-6835	27	5¼	5.14
6⅛"	6835-6881	46	7	6.57
6⅛"	6681-6945	64	8½	7.53
6⅛"	6945-6969	24	4¾	5.06
6⅛"	6969-6987	18	5½	3.27
6⅛"	6987-7037	50	7½	6.66
6⅛"	7037-7107	70	8½	8.24
6⅛"	7107-7165	58	9	6.44
6⅛"	7165-7228	63	9	7.00
6⅛"	7228-7301	73	10	7.30
6⅛"	7301-7339	38	9	4.22
6⅛"	7339-7395	56	9¾	5.74
6⅛"	7395-7434	39	9¼	4.22
6⅛"	7434-7495	61	9	6.78
6⅛"	7495-7542	47	9	5.22

Average weight on bit—12,000 pounds.
Average rotary speed—55 revolutions per minute.

Operations other than drilling in this hole, but in which air circulation was used include: jetting seven-inch casing dry, cleaning out and testing a fracturing treatment, fishing (not attributable to air), cleaning out after shooting. The latter operation appeared particularly conducive to air circulation. Clean out time following one 100 quart nitroglycerin shot required only 6½ hours.

This well failed to encounter commercial production and could not measure the results of air drilling into a productive zone. Nevertheless, the results which were obtained by an empirical approach and trial and error means at the well site are believed to be sufficiently encouraging to warrant further application of either air or natural gas in certain drilling operations.

The foregoing information is offered with the view that it may prove of value to other operators in the industry that may conceive of applying this or a similar technique in drilling operations which lend themselves to the absence of fluid and a minimum pressure opposite the formation.

ACKNOWLEDGMENTS

The writer wishes to express appreciation to Maurice A. Machris and Frank W. Lake, Wilshire Oil Company, Inc., and Penntex Oil Corporation, for permission to submit this article. Accomplishment of this work was made possible through the excellent cooperation and suggestions by members of Carl B. King Drilling Company and services of Dowell Incorporated and Midland Road Machinery Company.

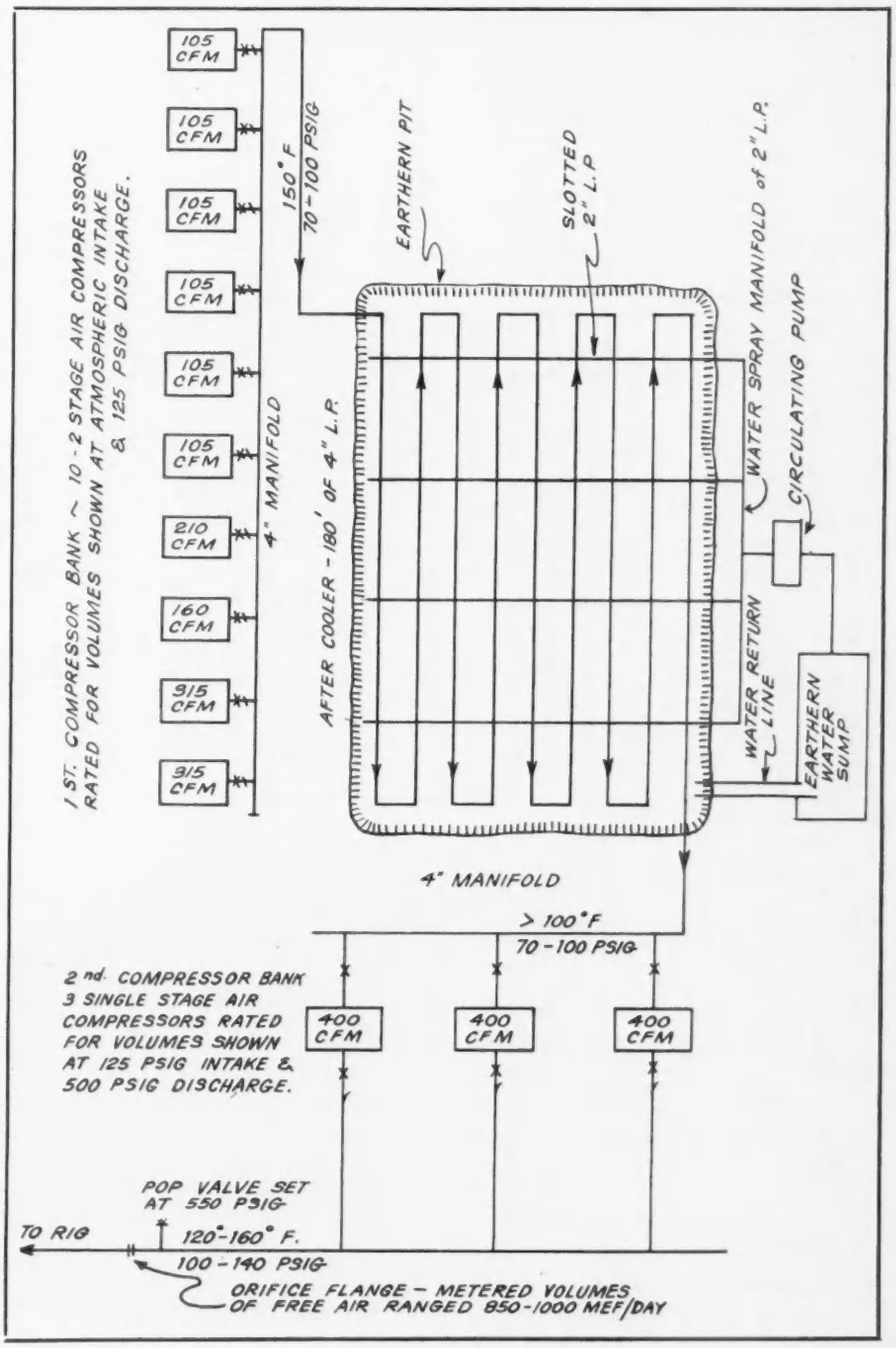
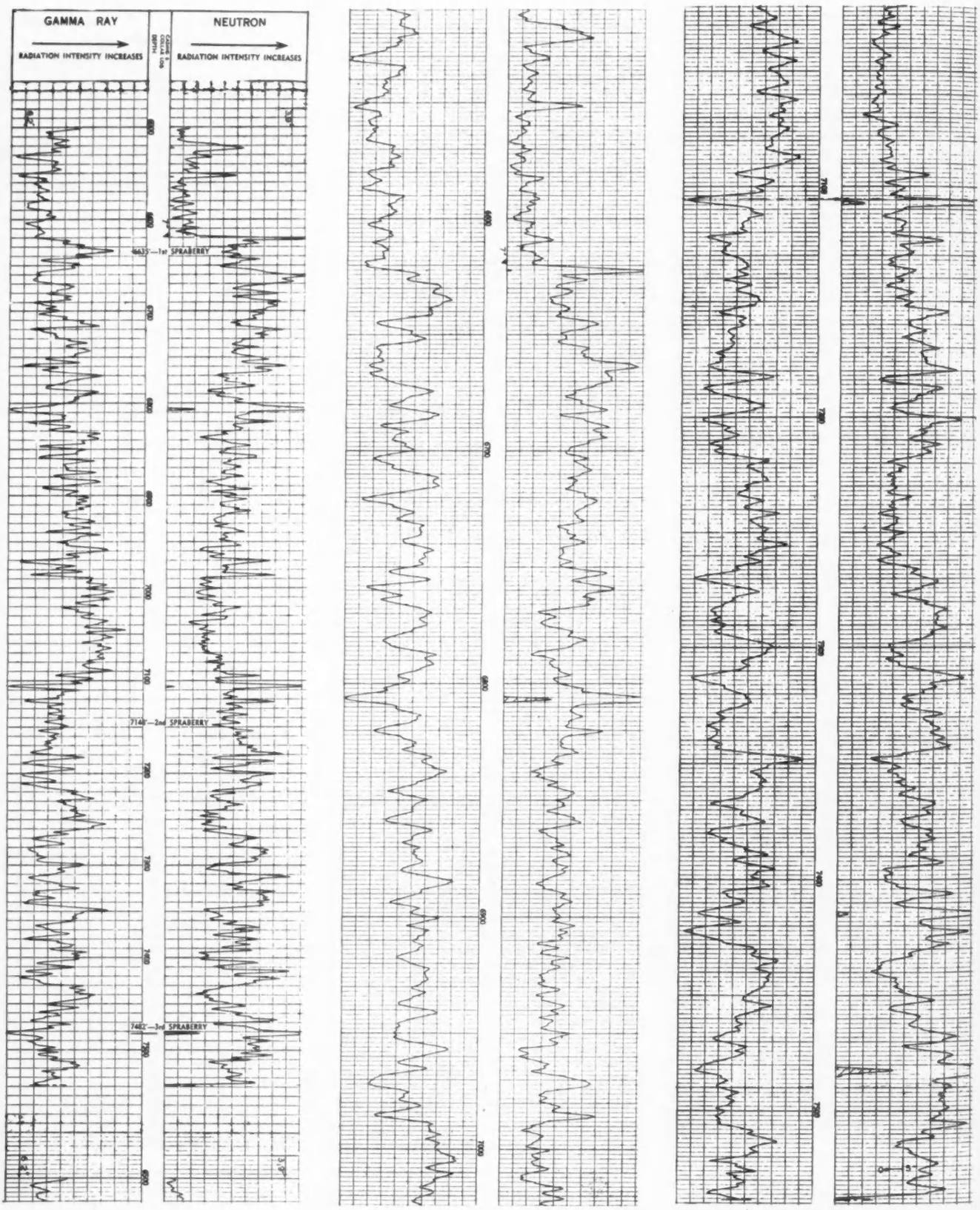


FIGURE 1

FIGURE 2. Radioactive log of the interval air drilled.

TYPE OF LOG	Gamma Ray	Neutron	Gamma Ray	Neutron	TYPE OF LOG	Gamma Ray	Neutron	Gamma Ray	Neutron
Run No.	1	1	2	2	Maximum Recorded Temperature	....	....	....	....
Date	6-2-51	6-2-51	6-24-51	6-24-51	Neutron Source Strength and Type	....	600N	....	600N
Total Depth (Driller) Rack	6668½	6668½	7542	7542	Source Spacing—In.	....	8.25	....	8.25
Effective Depth (Driller)	6668½	6668½	7542	7542	Length of Measuring Device—In.	36	9	36	9
Top of Logged Interval	6500	6500	6550	6550	O.D. of Instrument—In.	3⅝	3⅝	3⅝	3⅝
Bottom of Logged Interval	6666	....	7538.5	7538.5	Time Constant—Seconds	H	E	H	E
Type of Fluid in Hole	Mud	Mud	Mud	Mud	Logging Speed Ft./Min.	30	30	30	35
Fluid Level	6652	6652	7538	7538	Statistical Variation—In.	....	....	....	....
					Sensitivity Reference	274	275	274	275



Latest Applications of DIAMOND Coring

By R. W. STUART

President, Diamond Oil Well Drilling Company

THIS ARTICLE presents a general discussion of the recently discovered applications of diamond coring in continuous sampling programs, straight hole digging, rapid penetration of hard formations, Spraberry coring, washover and window cutting techniques. Particularly concerned with West Texas coring, drilling, fishing and window cutting problems, the article describes the varied and valuable application of diamond drilling tools.

DIAMOND coring was first observed by the oil industry as a successful operation in the Rangely Field in Colorado about five years ago. Long cores and fast drilling time reduced costs and introduced a new tool to the oil fields. In just five years, diamond coring has become common practice. Diamond coring is considered by many in the oil industry as essential in obtaining the geological and engineering information needed to produce oil most advantageously now and in the future.

The design of diamond bits and core barrels has become more or less standardized. However, during the last year, bits with low-priced diamonds have been used extensively. Performance of these bits, in every formation penetrated, has been as good as those set with more expensive diamonds, and in some cases even better. The "cheap" diamonds, as they are called by some, have as good a cutting surface as the higher priced diamonds and their cash salvage is very high. Low-priced diamond bits offer a low cost per foot and a high rate of penetration.

A diamond bit, which may be used successfully in all formations, and the latest design of core barrel are shown in Figures 1 and 2.

Diamond coring pay zones for accurate information accounts for a large percentage of the coring being done. However, to eliminate all guess work, continuous coring through long geological sections is becoming increasingly popular. Large cores with 100 percent recovery have made it possible for the geologist to obtain a complete picture. A laboratory analysis of any portion of the cores which appear productive will indicate the feasibility of further testing this zone. Proper use of the cores results in better correlation between wells, better completion practices, and more accurate reservoir studies. It is becoming more and more evident that continuous coring minimizes the troubles caused by inaccuracies and variations in the interpretation of drilling time, cutting samples and electric logs. Furthermore, the use of full-hole core bits results in costs per foot which are not prohibitive.

Here are a few of the many examples known of continuous coring through long sections where the results proved beneficial to the operator:

Martin County, West Texas: Cored 1811 feet (11,242-13,053 feet) continuously from Pennsylvanian through Ellenburger with six-inch outside diameter diamond core bit, recovering 99 percent of core.

Northern Panhandle Area, Texas: Cored 1162 feet (9545-10,707 feet) continuously from Pennsylvanian through Ellenburger with 4¾-inch O.D. diamond core bit, recovering 92 percent of core.

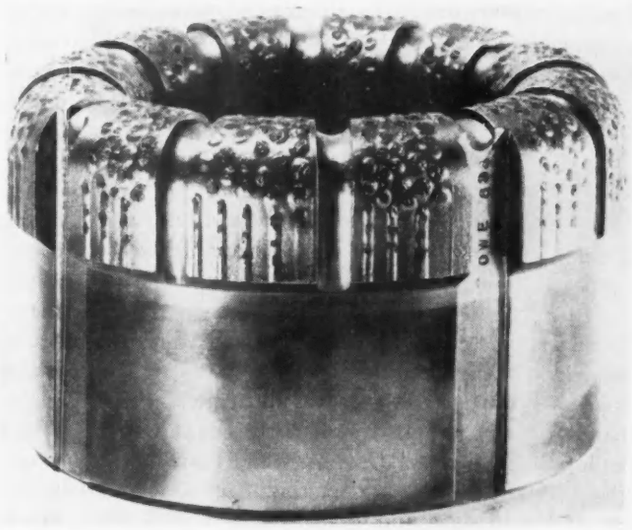


FIGURE 1. Universal diamond core head adaptable to the penetration of many different formations.

Valverde County, West Texas: Cored 1060 feet (10,530-11,590 feet) continuously with 4¾-inch O.D. diamond core bit, recovering 98½ percent of core.

Shafter Lake Area, West Texas: Cored 631 feet (9243-9874 feet) continuously in Devonian with six-inch O.D. diamond core bit, recovering 96 percent of core.

Midland County, West Texas: Cored 653 feet continuously in Spraberry and Pennsylvanian zones with 8¾-inch O.D. diamond core bit recovering 95 percent of core.

Tulsa County, Oklahoma: Cored 1289 feet (44-1333 feet) continuously with 8¾-inch O.D. diamond core bit, recovering 98 percent of core.

Diamond Coring the Spraberry Formation

The recently discovered Spraberry production covering a large area of the central Permian Basin of West Texas has posed many problems for which diamond coring has been particularly beneficial. The Spraberry (Figure 3) a sandy section in the Leanard formation of the middle Permian, being tight, silty, interbedded with shale and vertically fractured, was believed to be nonproductive for the most part due to its peculiar characteristics as indicated by early electric logs and drill-stem tests. More thorough investigation proved the Spraberry a commercial producing horizon, but requiring careful completion programs utilizing detailed knowledge of the formation. Cores and core analysis have provided the only method of obtaining this detailed information, enabling the operator to determine completion programs, reservoir analysis, and in many cases the feasibility of drilling additional wells. For this reason a large number of Spraberry wells are being diamond cored and the resulting data carefully studied.

Special applications of diamond coring particularly advantageous in the Spraberry include: Use of cores to determine the best method of fracturing the formation, assurance of smooth walls on the face of the hole by diamond coring enabling packers to hold while fracturing the formation, and use of core orientation to determine direction of vertical fractures throughout the trend.

Diamond coring in the Spraberry is economical and recovery is excellent. Most of the coring is done with crude oil and the resulting core analysis conforms to production tests now being run.

Hard Formation Drilling

There are many formations being penetrated that are slow and expensive to drill with rock bits. These formations include chert, hard dolomites, hard sandstones, granite, etc. As wells are drilled deeper, the troubles encountered in hard formations are greatly amplified, i.e., slow drilling, short footages per bit, slow, frequent trips, increased fishing jobs, and greater wear on the drilling equipment. In attempting to overcome these troubles, diamond coring has been used when the drilling became difficult, and the results have been so gratifying that it is now becoming common practice in several zones.

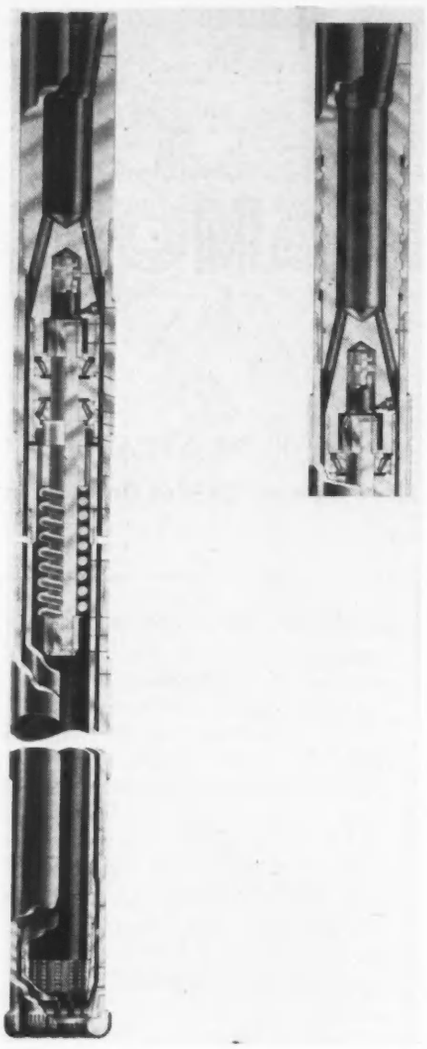


FIGURE 2. Profile of diamond core barrel unit.

Full hole diamond coring, to make hole, has many advantages, including: (1) faster rate of penetration; (2) longer footage between trips; (3) less weight on bit requiring fewer collars; (4) less chance of a twistoff; (5) fewer trips; (6) smaller cuttings, requiring less circulation; (7) less chance of getting stuck and lost; and (8) continuous cores through the section for geological and engineering study.

An example of economical use of the diamond core bit in extremely hard formation was illustrated in the Keystone area of West Texas where 100 feet of Devonian chert was cored in five days, after the offset well took 13 days and 28 rock bits to drill the same section. Another example was the deepest well drilled in Eddy County, New Mexico, where the final 275 feet of hard Ordovician was cored with a 6¾-inch O.D. diamond bit to a total depth of 14,865 feet.

Other examples of making hole economically with diamond bits are seen in the continuously cored wells cited in the second section of this article.

Straight Hole Drilling

There are many steeply dipping formations where it is extremely difficult to keep the hole straight with regular drilling methods. The general practice is to drill with a very light weight on the rock bit in an attempt to keep the hole straight. This is slow, expensive, and often unsuccessful. Some contractors have been drilling as fast as possible until the hole drilled past allowed limits and then whipstocked the hole straight. This is only an expediency and is not done very often.

The use of diamond coring equipment through these formations has been extremely successful. The coring has gone almost as fast as regular drilling and the drift of the hole continued normal and in some instances decreased.

Diamond coring equipment, when used to drill through steeply dipping formations, should consist of the strongest barrel available and all equipment should be in top condition. Full hole coring should be done with sufficient drill collars to keep the drill pipe in tension while drilling.

Diamond Washover Shoes

Often when pipe is stuck in a well it is necessary to wash-over before it can be pulled out. The diamond shoes will quickly cut through steel at the top of the fish or at any point of obstruction along the fish, including reamers and rock bit cones. Also, the diamond shoe will ream out the hard formations which have fallen into the hole or form the walls of the hole.

There have been several designs of diamond washover shoes, most of them built along the pattern of a regular diamond bit as shown in Figure 4. The diamonds in these shoes are molded in the matrix metal which is fused to the steel blank in one operation.

Recently, a new type diamond washover shoe (Figure 5), has been giving excellent results. These shoes are made in any oil field shop, to the size desired, in a matter of hours. For these shoes diamond-studded inserts

are made by the bit manufacturer. After determining the correct size shoe, a steel blank is slotted in the shop to receive the diamond inserts which are brazed in place. These shoes are quickly made and cost less. Also, the steel blank protects the brittle inserts so that they do not crack or break.

There have been sufficient runs made by these new type shoes to say that the results are impressive and that there is a very definite place for them in the oil field.

Cutting Windows in Casing

In wells where heavy N-80 casing has been run, the use of mills to open a window in the casing has been very unsatisfactory and in some cases impossible. In attempting to use conventional mills with a whipstock to open a window in casing, two problems arise which tend to make the job unsatisfactory. First, the mill will not cut away the tough steel fast enough to make it economically feasible; and second, after the window is started and the hard formation outside the casing is encountered, the milling progress decreases even more and the mills are quickly worn out. Also, the slow milling will cut away the whipstock in many cases so that a poor job results.

Diamond core bits have been run on barrels to successfully cut windows in casing off of whipstocks. The results were unusually good and as more runs were made, several methods were found to make the job run better. Among these was being sure that a sufficient amount of kelly was up to keep from making a connection after the window was started; another was the need to carry low weight and low rotary speed while milling the window. Also, it was found desirable to open the window for a couple of feet with conventional mills and then follow with a diamond bit to cut the window to completion. The diamond bit is stabilized in this manner by the sliver of uncut steel which curls up through the coring bit into the core barrel. After the window has been cut, it is desirable to immediately pull out of the hole with the sliver of steel rather than continue to make hole in the open formation.

Recently, diamond bits and single tube core barrels have been run on

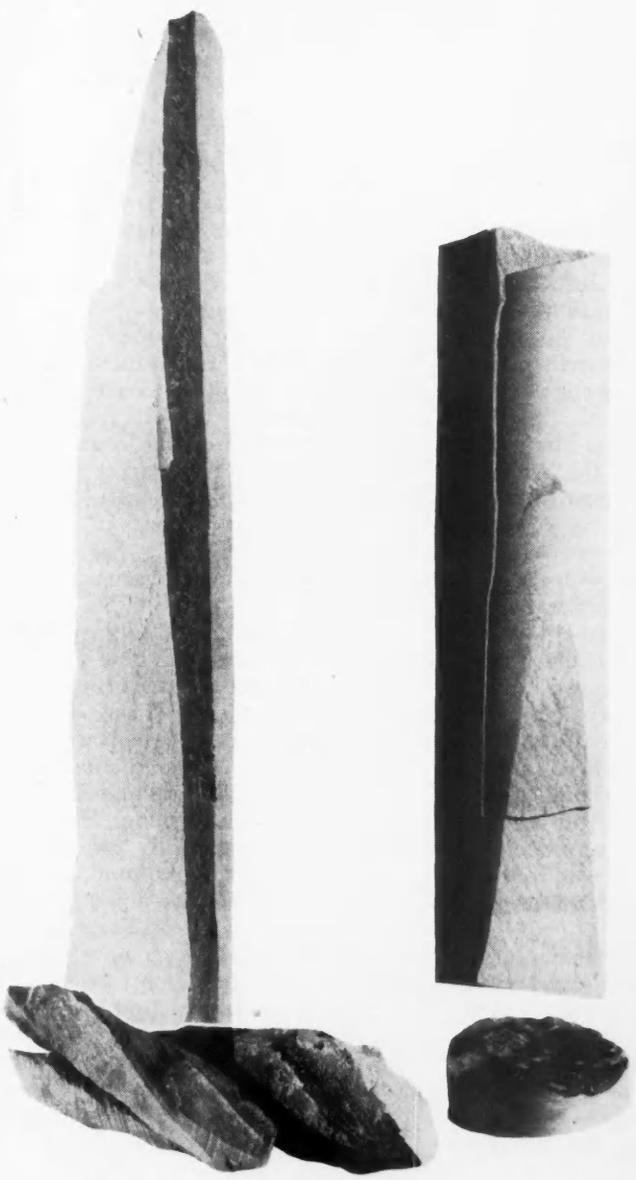


FIGURE 3. Sectioned and full specimen of Spraberry formation. Intricate fracture pattern may be seen in upright cores, while the lower section illustrates unusual vertical distortion. The core specimen on the lower right shows large, imbedded fossils peculiar to the Spraberry.

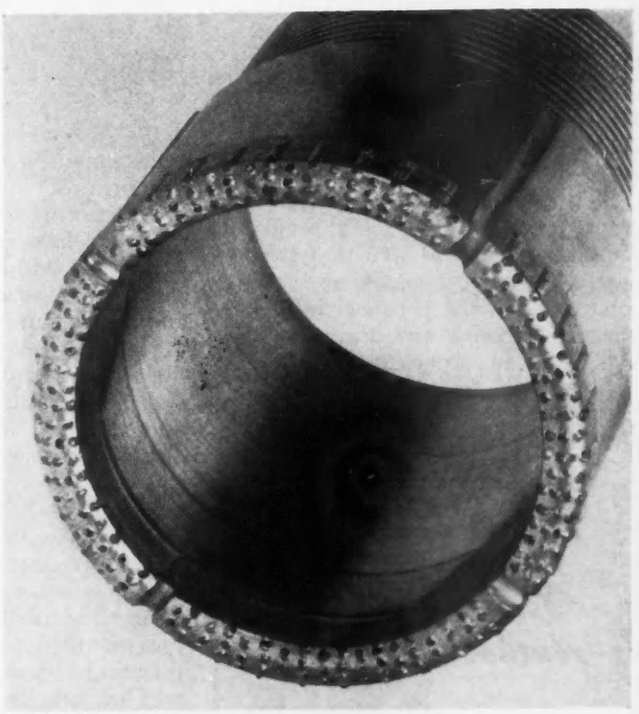


FIGURE 4. Standard, factory-made diamond washover shoe.

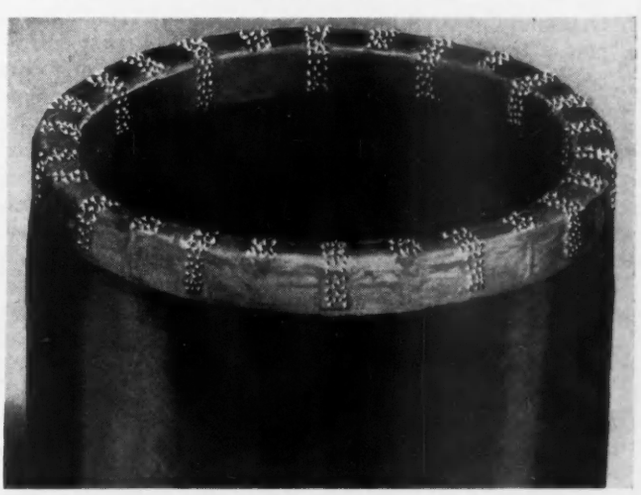


FIGURE 5. Insert diamond shoe, tailor made in the field for each individual job.

whipstocks and the resulting windows were cut faster with a minimum amount of trouble. It is believed that diamond bits and single tube core barrels will reduce the cost and operating time for cutting windows in heavy casing.

A striking example of successfully cutting a casing window with a diamond core bit took place in a well in the Benedum area of West Texas which had plugged back from a total depth of 12,000 to 10,400 feet, at which point a whipstock and diamond core bit were used to cut through the casing to make new hole.

Contract Diamond Coring

Diamond coring was first accomplished by operators who purchased barrels and diamond bits and supervised the operation. This was necessary since the rapid advancements in design of equipment and the technique of coring required considerable investment and engineering supervision which established a demand the companies selling coring equipment could not meet.

As the use of diamond coring equipment became universal throughout the oil fields, it was seen that greater care of the equipment and closer supervision of the coring reduced the hazards of coring and decreased coring costs. In order to attain these ends, some companies selling coring equipment set up service departments, provided core barrels for rent, and furnished field engineers to supervise the coring. Although this rental service was a great deal more trouble and the remuneration was less than the straight sale of coring equipment, the service companies were farsighted enough to see that better coring operations would increase the over-all diamond coring program. The operators continued to buy the diamond bits and stood all the hazards of coring; however, these hazards were considerably reduced by better equipment and closer supervision.

As many of the large operators increased their capital investment in diamond bits and the smaller operators had bits they seldom used, a need arose for the rental of diamond bits, along with the core barrels and engineering advisors. This need initiated "contract coring," i.e., rental of complete coring equipment (bit and barrel and engineer) at a specified price per foot cored, and it was soon apparent that the contract method had a definite place.

Contract coring with diamond bits on a widespread basis required a large capital investment on tht part of the contractor and a stockpile of bits in each area where diamond coring was in demand. There was much opposition to contract coring among the diamond coring companies, and many seemingly valid reasons were given to the operators for not using this service. However, two diamond coring companies combined their knowledge of formations, coring techniques and coring equipment to start contract coring on a large scale. The results have been many satisfactory jobs and a steadily increasing demand for contract coring.

This is understandable since there are many advantages to be found in contract coring for the operator, both large and small. Among these advantages are no capital investment, no worries about moving bits from various points to the coring location, no trouble securing the correct size bit for a coring job, no obsolete bits in stock, no salvages to work out, careful supervision, and final cost known from the start on a charge-per-foot basis.

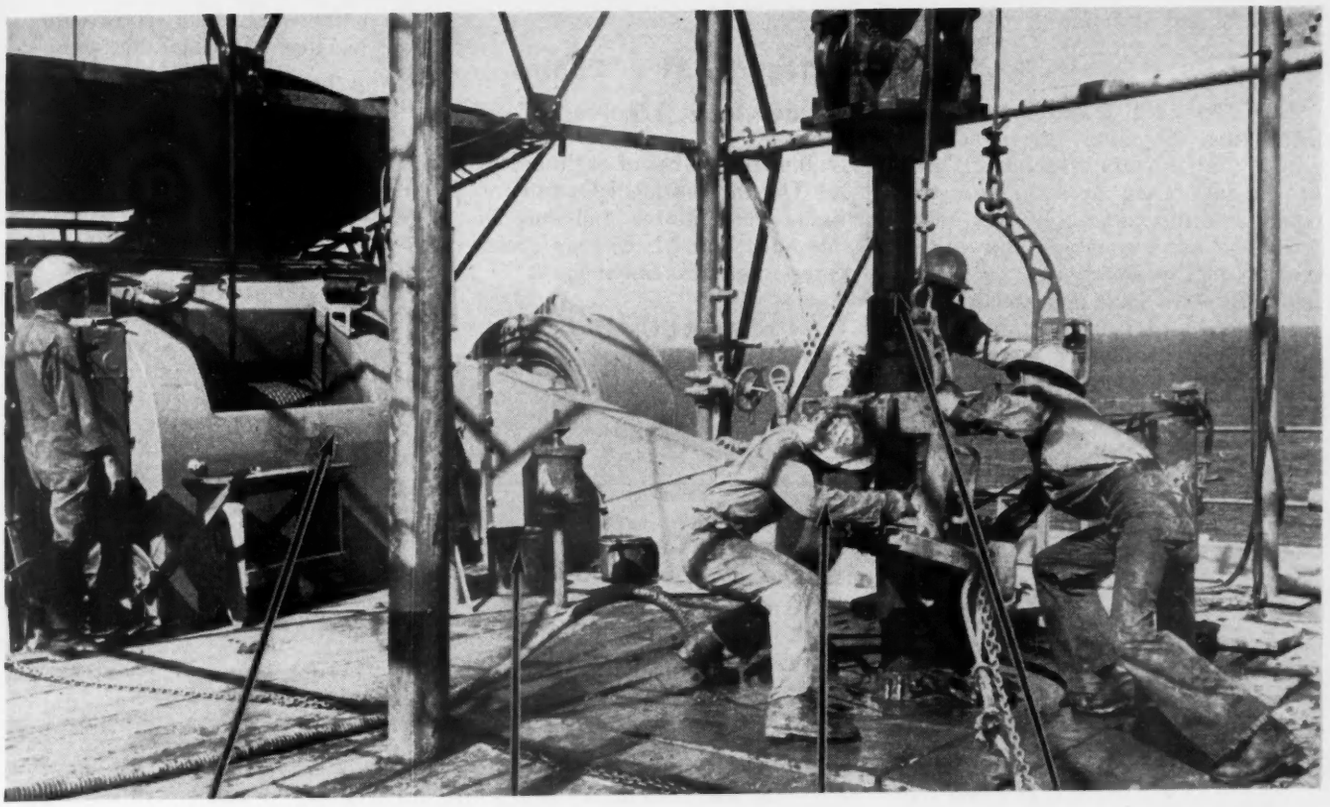
Diamond coring equipment has steadily improved and new applications as a drilling tool are being found with its increased use. There are several new applications which were not discussed: For instance diamond bits on wire line core barrels and diamond bits for full hole drilling. However, these tools are not fully proven and further tests will be required to show whether they will have a place.

The successful use of diamond coring equipment depends on two factors: Careful supervision furnished by the service companies, and the operating conditions at the well; i.e., good rigs, clean holes, sufficient drill collar weight on the core bit, good drilling mud, etc. As the operators realize the advantages of good operating conditions, more and more effort is being made to have the well conditions as close to ideal as possible before coring is started. The result is cheaper, faster coring jobs.

FIGURE 6. Ellenburger cores showing fracturing and redeposited material.

About the Author

R. W. STUART, President of Diamond Oil Well Drilling Company, graduated from Rice Institute in 1933, with the degrees of B. S. and Ch. E. He was employed by Humble Oil & Refining Company from 1933 to 1935 and then became affiliated with Stanolind Oil & Gas Company as a mud engineer. In 1938, he became a research engineer and supervised laboratory and field work in drilling mud, drilling and logging practices. He joined the Navy in 1941 and was drilling supervisor at the Elk Hill Naval Petroleum Reservoir. He left Stanolind to organize the Diamond Oil Well Drilling Company.



Equipment Costs	Miscellaneous Costs	Labor Costs	Rate of Penetration
Up 63%	Up 58%	Up 58%	Increased 54%

Expenses Skyrocket---Revenue Per Foot Falls In Contractor's Battle for Existence

By W. B. COLVIN
WORLD OIL Staff

A TERRIFIC increase in operating expenses has placed drilling contractors in a precarious position. An extensive survey of West Texas drilling contractors reveals that since 1945 labor costs have risen 58 percent, equipment expenses 63 percent and miscellaneous expenditures 58 percent for an overall raise of 60 percent in total drilling costs. Meanwhile, the contract rate per foot of hole drilled has remained dangerously stable, and the resulting net revenue per foot has fallen 15 percent.

LABOR has not responded in proportion to the many benefits received in the past five years. With more than 600 rigs running in West Texas, there is a need for nearly 9500 crew members—considering the major operators who schedule relief crews. The caliber of labor available is in need of extensive operational training plus the guidance of competent industrial relation and safety advice. Some contractors and, of course, the major operators have made paid vacation plans available to rig personnel. Again, travel allowances are granted in some instances. However, even with these advantages, the crew turnover in West Texas is a major problem. When the chert or "suitcase sand" is encountered, it is not a surprising sight to see crew members "spoolup" and seek employment on rigs below or above the chert horizon. The West Texas contractor attributes the serious personnel turnover to the attraction of defense industries, more settled jobs, and general lack of nearby housing. Because personnel training is expensive, the loss of a seasoned crew member affects the

efficiency and economy of rig operation.

EQUIPMENT is offered at tremendously increased prices accompanied by certain machinery improvements. Like the contractor, the equipment manufacturer has been faced with unreasonable jumps in the cost of steel, prefabricated parts and labor. Strikes have led to strife in economical equipment fabrication. All these problems are ultimately thrown on the shoulders of the drilling contractor, who has been forced to stretch the efficiency of each bearing and bolt to its upmost limit. Even the process of compiling and printing price data has become a problem since a completed, comprehensive list becomes obsolete before the press cools.

MISCELLANEOUS EXPENSES include the cost of rig transport, lubricants, and associated necessities. Item No. 1—rig transport—presents a serious economic problem to the drilling contractor. Trucking facilities are limited in the area and the trucking contractor has been faced with increased expenses paralleling those of the drilling contractor. Huge sums have been invested to equip tools for location-to-location skidding in the direction of reducing the transportation expense.

TOTAL DRILLING COSTS represents a summation of the labor, equipment, and miscellaneous expenses. Naturally, this figure has spiraled at an astounding rate. What can be done about it . . . nothing except to operate more efficiently. Labor, equipment and miscellaneous expenses are beyond the realm of the contractor's control.

REVENUE PER FOOT DRILLED has plummeted. However, the ingenuity of the drilling contractor has softened the fall of revenue per foot by increasing the rate of penetration. Yet even this factor is approaching the horizon of definite limitation. It is conceded that this outstanding increase in penetration rate is a consoling feature which offers assistance in offsetting high operating expenses. However, with present equipment stretched to the limit, will it be possible to maintain increased penetration abreast of rapidly rising operating expenses?

An analysis of the problem dictates that, if costs continue to rise, if contract prices remain at the same stable level, and if penetration rates and technique improvements do not progress at an astounding rate, the drilling contractor—who currently is not being awarded reasonable profit—has a hazardous future.

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The West Texas area is equipped with some of the finest rigs, services and facilities in the industry. However, this high standard is on the verge of disintegration and, in time, the operator in the vicinity will not have the privilege of requesting bids from well-equipped, efficient contractors.

The appearance of this dangerous situation will open the door to the unethical contractor, fortunately a minority in the fraternity, who is prone to bid jobs in at rates cut to the bone. Operators within this category offer poor, undependable rigs and must drill a hole as rapidly as possible with no respect for the basic premise that a well bore must be straight, efficient mud control must be respected, and casing must be run with care. The cut-rate contractor, under the protection of company day work, will offer excuse after excuse for machinery breakdown—a result of overloading and burning-up poor equipment during the process of drilling on a contract footage basis. This will be the net result of a current trend toward providing the legitimate contractor with rates which barely absorb actual drilling expenses.

The progress made by aggressive West Texas drilling contractors is noteworthy. During the past five years, a majority have invested heavily in equipment unitization, personnel training programs, increased supervisory and technical staffing, transport features permitting expedited skid jobs, and a constant vigil in the direction of improved, scientific drilling technique. But the contractor's rewards for his effort have been scant and uncertain. For example, the reported increase in penetration rates is possible only with good fortune. Loss of circulation in the area is a predominating problem which may tie up a rig for days, weeks or months. Hard rock drilling is conducive to frequent twistoffs, which again require the inauguration of time-consuming operation. In all, the drilling contractor is quite fortunate to operate at a constant pace paralleling the reported increase in the rate of penetration factor.

Trends in Drilling Costs and Revenue
(1945 compared with 1951 level)

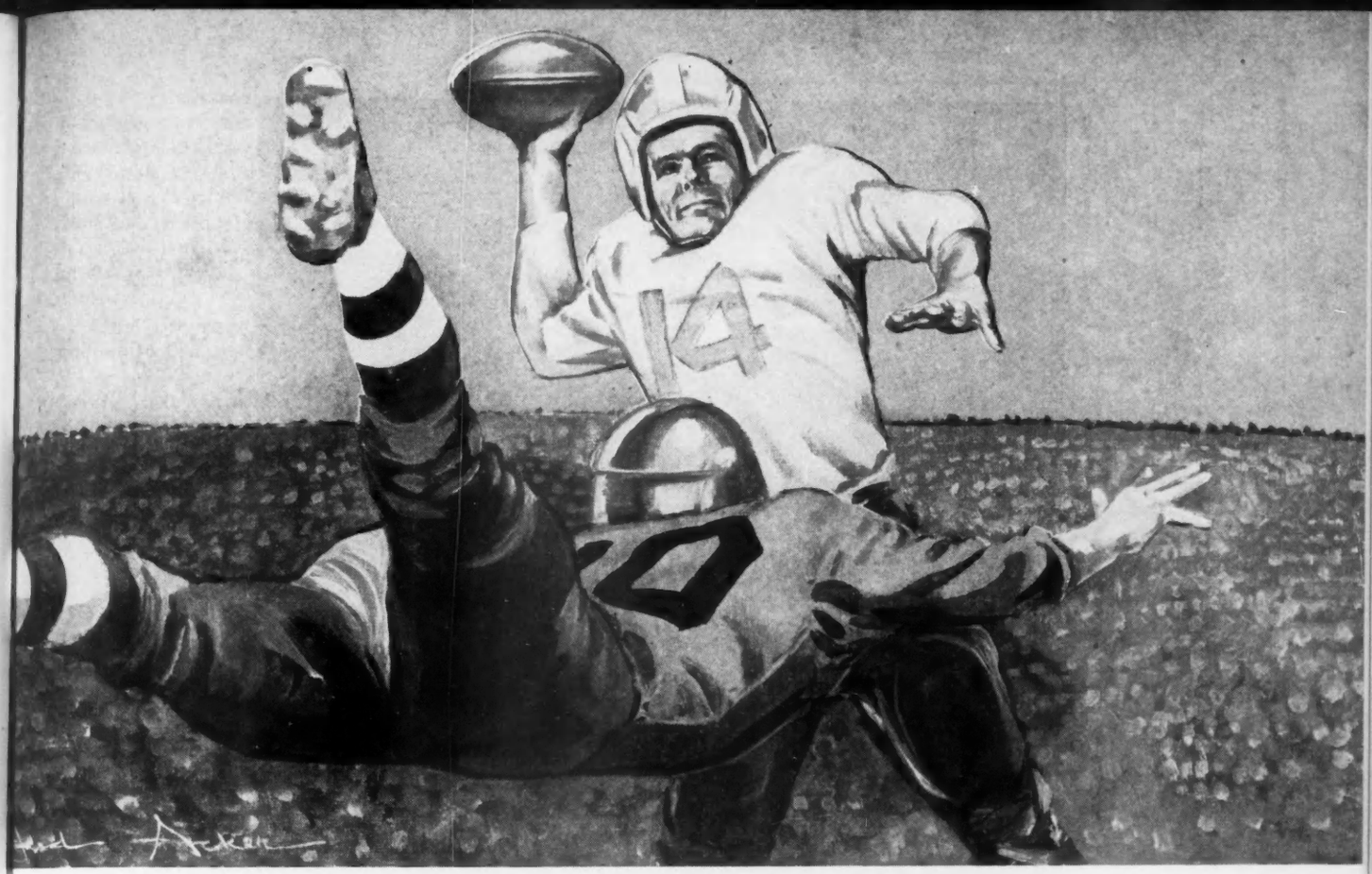
DRILLING COSTS:	1945	1951
Labor Costs	100%	158%
Equipment Costs	100%	163%
Miscellaneous Expenses	100%	158%
Total Drilling Costs	100%	160%
Revenue per Foot Drilled	100%	85%
Rate of Penetration	100%	154%

Plan for Survival

A program must be designed to alleviate this dangerous situation. The drilling contractor, a keystone in the industry, must be protected and his existence assured. No one can continue to invest millions in drilling tools for negligible compensation.

One solution would be for producers to avoid the practice of awarding contracts to drilling tool operators submitting bids at prices below the actual expense of completing an operation. A majority of the oil operators realize the ultimate expense which will confront the drilling contractor in the process of drilling a hole and, incidentally, many majors will not release a contract to cut-rate bidders. This is a likely solution if the oil operator wishes to see the contractor continue to provide efficient, modern tools. A consummation of this plan is, of course, entirely up to the oil operator.

In a final analysis, the drilling contractor must avoid price cutting and the oil operator should award work to the drilling operator offering a legitimate bid which permits the accumulation of reasonable profit. The present situation is not the basic fault of the drilling contractor or the oil operator. A digest of data presented herein will immediately assign the responsibility to agencies distant from the oil industry. Salvation is possible through the cooperative efforts of the contractor and oil operator.



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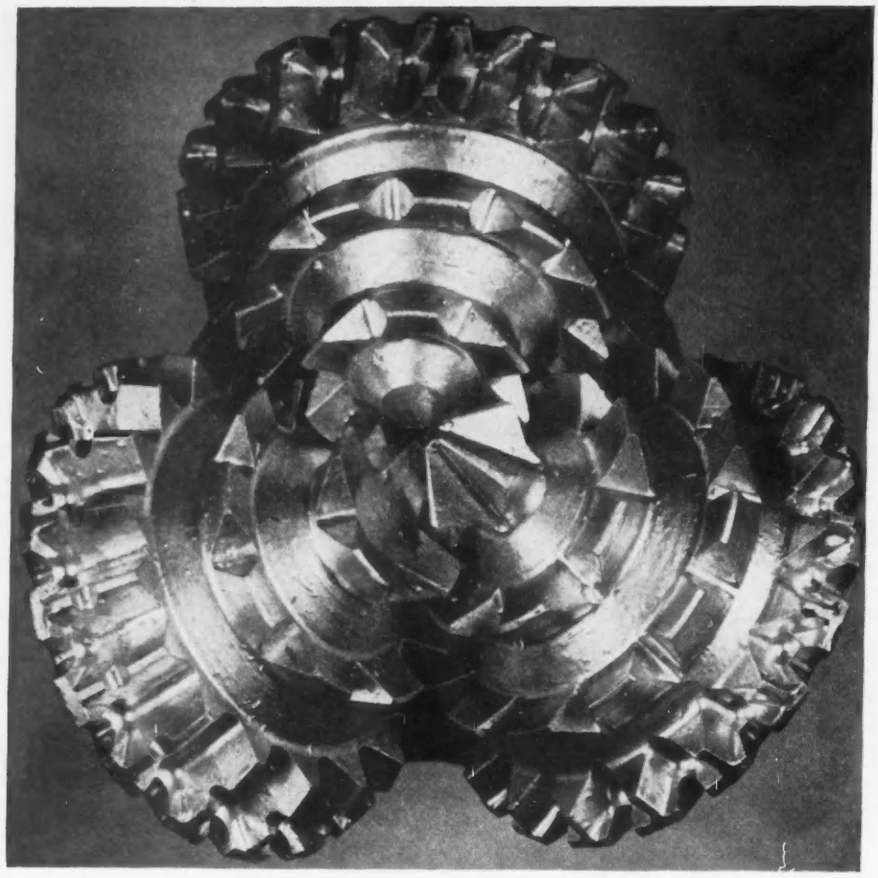


An improved bit for percussion drilling.

Rotary Percussion Drilling In West Texas

By J. A. WANAMAKER

Area Drilling Engineer, Shell Oil Company

PERCUSSION DRILLING, a technique introduced several years ago, has had several recent improvements. Discussed in this article are major changes in design. The introduction of the percussion drill has made possible improved hard rock penetration rates and reduced drill pipe fatigue.

THE first successful and sustained application of rotary percussion drilling in West Texas took place in 1948 when more than 1500-feet of hole was drilled in a well in the Santa Rosa field, Pecos County. The idea of percussion drilling is not new, for patent rights granted more than 60 years ago show that attempts have been made to utilize a percussive force to drill holes in the earth. The design and operation of the percussion drill has been thoroughly covered in various API papers and trade publications (see bibliography), and this paper will attempt only to report the latest developments in the drill, and the application and results of rotary percussion drilling by the author's company in West Texas operations.

The rotary percussion drill appeared to offer a possible advantage in drilling the hard friable West Texas chert formations, which are slow and expensive to penetrate by conventional rotary methods. The original and primary objective of the drill test program was to develop a tool that would economically drill chert. In the first phase of the program about 900-feet of hole was drilled in West Texas with varying degrees of success before the successful and profitable operation in the Santa Rosa well.

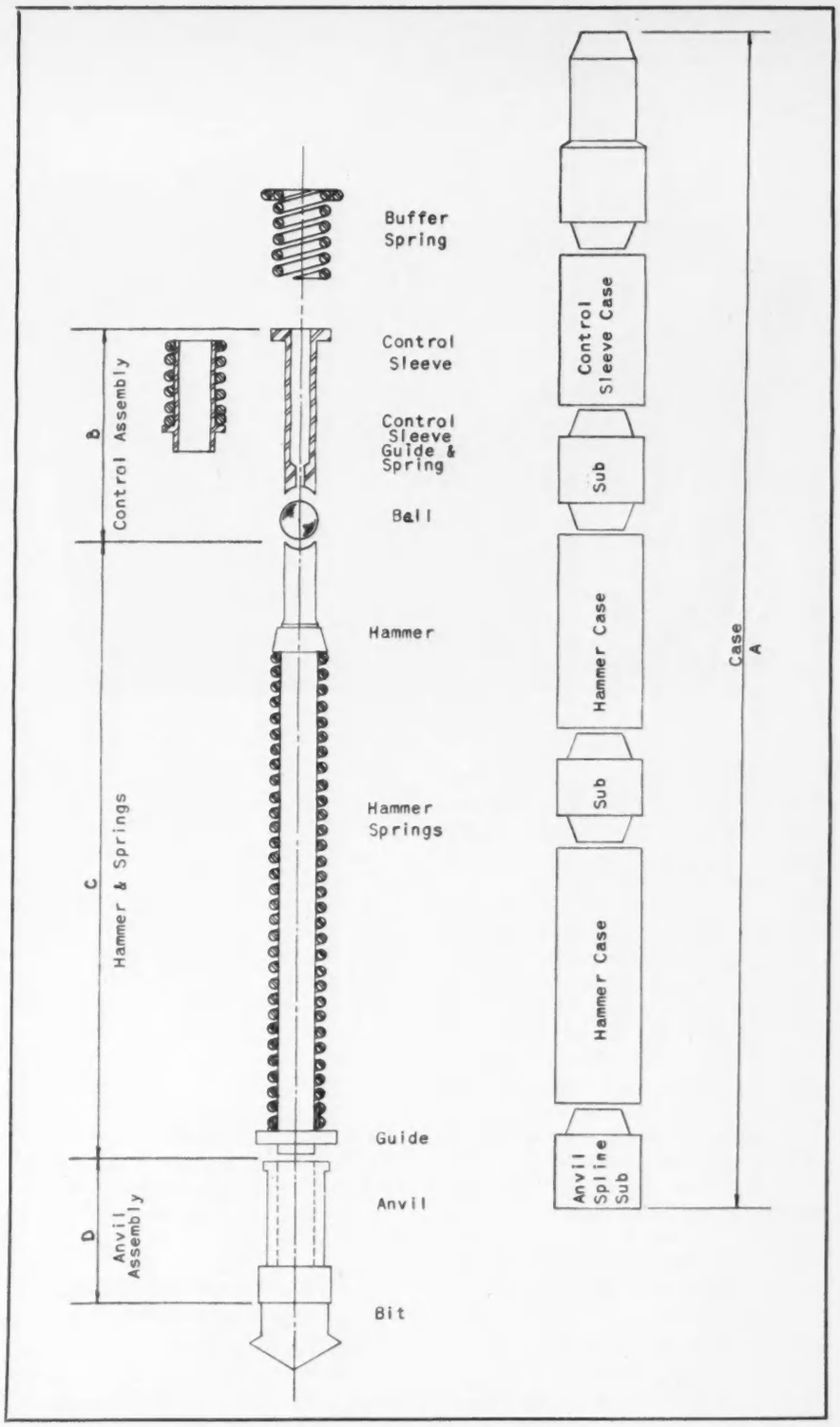
As shown in the drawing on opposite page, the drill consists of four main components: (1) the case, which contains the working parts; (2) the valve mechanism, which controls the reciprocating movement of the hammer; (3) the hammer, springs and guides, which make up the reciprocating member that delivers the impact;

and (4) the anvil assembly which transmits the hammer impact to the bit. Essentially, the drill is a "mud engine," placed in the drill stem directly above the bit, which derives power from the drilling fluid and transmits this power, in the form of percussive impact, to the bit and in turn to the formation.

In the original design of the drill the control element consisted of a piston and sleeve arrangement. This design, with a hammer weighing 600 pounds, delivered 200 to 300 strokes per minute to the bit. Fluid abrasion was severe on this control element, if the drilling fluid contained particles of sand or chert, and the drill would noticeably lose power after eight or ten hours of operation. As the drill development progressed the control assembly was modified and the piston-sleeve element was replaced by a ball and seat arrangement. This new control assembly has greatly increased the power of the drill, life of parts, and reduced operating costs due to the longer life. Newer drills with the ball and seat control element and a 288-pound hammer operate at frequencies ranging from 900 to 1200 strokes per minute, and with the heavier hammers have more than doubled the frequencies over the rates with the piston-sleeve control element.

Along with the development of the ball control element, which gave a tremendous increase in power, experiments have been conducted with lighter hammers in an attempt to obtain a light, fast impact on the bit. The initial hammer weight with the ball control drill was 560 pounds which operated at frequencies of 500 to 900 strokes per minute. Hammers weighing 288 and 148 pounds have been tested and operate at frequencies of 900 to 1200 and then to 1600 strokes per minute. Although results with the light weight hammers are not conclusive, tests have shown improved bit life and improved penetration rates in some formations.

Concurrent with the problems of drill development, there has also been the very important problem of bit development to utilize effectively the percussive power available to drill or destroy the formation. The initial field tests of the drill were made with solid head and conventional rock bits which immediately proved to be unsatisfactory. The conventional rock bits were destroyed in as little as 30 minutes operation of the hammer, and the solid head bits gave generally poor results in rotary operations due to inherent characteristics of the design; i.e. to obtain the metal strength necessary to absorb the impact force, shearing strength was sacrificed, and the solid cutting elements were destroyed when the bit was rotated. Also, a full gauge bit would not go to bottom without reaming and rapid wear of the gauge cutting elements occurs in the solid head bits.



Schematic drawing of the percussion drill.

Several bit manufacturers contributed to the percussion bit development, and various single-cone, two-cone, tri-cone, and cross-roller bit designs were tested along with the solid head designs. Experience gained from these tests led to the development of a tri-cone percussion bit.

The percussion bit has inner rows of solid circumferential teeth, and an outer row of webbed elemental teeth on each cone. The bearings are solid journals and the bit is much stronger than a conventional tri-cone bit. This bit proved to be satisfactory, and is still the standard bit for percussion operations in chert formation.

After the initial objective of rotary percussion drilling — improved per-

An early bit designed exclusively for percussion drilling.

formance in drilling chert — had shown satisfactory progress, development work was directed toward percussion operations in other formations. Although chert formation has been the most expensive to drill by conventional rotary methods, the footage drilled in chert represents only a minor percentage of the total footage drilled in West Texas. The predominant formations in this area are limestone and dolomite, which range from relatively soft to very hard, and drill fairly fast with conventional rotary tools. The first efforts to drill limestone formations with the drill were made with the percussion bit illustrated above. Tests were made with conventional, solid head, two-cone, cross-roller and "notched" bits but all generally failed to equal conventional penetration rates. However, results of these tests led to the recent development of the tri-cone bit shown on Page 182.

This special bit has an outer row of elemental teeth on each cone, and inner rows of circumferential teeth. Solid journal bearings are again used in this design to give increased strength for percussion action. These bits are still being evaluated in field tests, but combined with the light weight drills, have in some instances out drilled conventional tools in lime formations.

Development work is still under way on the percussion bits, and design changes are made as experience and test results dictate. However, with the present drill and bits, economical performance is usually assured in drilling chert formation, and economical performance in limestone formation seems to be "just around the corner."

Application of the Rotary Percussion Drill

The first application of the percussion drill was in hard chert formations, and with the development of the drill to where sustained down-the-hole operation is possible, it has become standard practice in the author's company to employ the drill whenever chert sections are encountered. The drill performs best in hard friable formations, the greatest advantage being gained in sections approaching 100 percent chert.

The second application of the drill was in hard formation "crooked hole" drilling, where it is necessary to carry light weight-on-bit in conventional rotary drilling to decrease or maintain the hole deflection. As a result of this, light weight, conventional penetration rates are slow and drilling costs are high. During the early work with the drill it was noted that the weight-on-bit had very little effect on penetration rates in hard formation, and that it would drill as fast with 2000 pounds weight on the bit as it would with 30,000. This characteristic of the drill immediately brought to mind the possible use in "crooked hole" sections, where it would be possible to carry light weight-on-bit and yet maintain a fast and more economical penetration rate. In a few instances in "crooked hole" applications the drill has shown some hole straightening tendency, but in general the drill will not straighten a crooked hole, but will maintain the same degree of deflection of the depth at which it was placed in the hole. Thus, the percussion drill is not a cure for crooked hole, but is used to prevent excessive deflection and to maintain economical drilling rates in crooked hole sections.

The third and newest application of rotary percussion drilling in West Texas has been in limestone formations. Although the work has been largely experimental the initial results have been encouraging. Further tests of the light-weight hammer drills and bit designs are being conducted in this formation.

At this point it might be well to add a brief word on the actual operation of the drill in the field. The original design of the percussion drill was rather complicated and required technical supervision to insure proper operation. As development progressed, however, the design was simpli-

TABLE 1

FORMATION	PERCUSSION					CONVENTIONAL				
	Footage Drilled	Rotating Hours	No. Bits	Avg. Feet per Hour	Avg. Feet per Bit	Footage Drilled	Rotating Hours	No. Bits	Avg. Feet per Hour	Avg. Feet per Bit
Anhydrite	485	18¼	2	26.5	242	619	25	2	24.9	309
Shale	666	42½	4	15.6	166	689	59	3	11.6	229
Lime and Dolomite	5162	1123½	90	4.6	57	6980	1138	106	6.13	65.8
Chert	1577	822½	75	1.91	21	595	507	53	1.17	11.2
Total	7890	2006¾	171	3.93	46.1	8883	1729	164	5.1	54
Initial Drill Development—Total	4066	1402¾	99	2.89	41.0					
Latest Drills (Ball Control)—Total	3824	604	72	6.33	53.1					

fied and in the past year it has been possible to entrust the supervision and operation of the drill to the drilling rig foreman when using the drill on company tools. After a few runs the rig crews become adept and it quickly becomes a short, routine matter to dress and rerun the drill.

Results of Percussion Operations

As shown in Table 1, about 7890 feet of hole has been drilled by the rotary percussion method by the author's company in West Texas operations. The formations drilled have been anhydrite, shale, limestone, dolomite and chert, and range in depth from 350 to 13,480 feet. The largest part of this footage has been drilled in experimental work, and it will be noted from the tabulation that after the major design modifications were made in the drill, the over-all average for rotary percussion drilling increased from 2.89 to 6.33 feet per hour and from 41 to 53 feet per bit. It will also be noted that the greatest advantage over conventional rates as shown in the tabulation is in chert formation. However, in a recent test in a dolomite formation, the rotary percussion drill was used on 1620 feet of hole with an average penetration rate of 10.4 feet per hour and 135 feet per bit. Compared to conventional results in an offset well, the rotary percussion method showed a 48 per cent increase in drilling rate and 120 per cent increase in bit life. These results have been included in the tabulation.

In chert formation, the results show an average drilling rate of 1.91 feet per hour and 21 feet per bit with percussion methods as compared to 1.17 feet per hour and 11.2 feet per bit with conventional methods. Of the total, 1577 feet of hole drilled in chert formation, chert concentrations ranged from 10 to 100 percent. A recent run in chert formation with the percussion drill and a 288-pound hammer gave an average drilling rate of 3.9 feet per hour and 25 feet per bit in drilling 300 feet of hole. The results of percussion operations in this well are also included in the summary.

The power of the drill has been increased to the point where it is possible to damage or destroy the special percussion bits, and it has been necessary to reduce the power to prevent bit damage. This has been accomplished largely by using the lighter hammers, although the power can be controlled to some extent by the fluid circulation rates and hammer stroke length. The loss of power has not been as serious as might be imagined, since the higher frequencies of the lighter weight has extended the bit life and maintained the advantages of percussion drilling.

The two operational problems encountered in rotary percussion drilling, the drill vibrations and drilling a tapered hole in hard formation have varied in severity from well to well. Rig vibrations set up by the drill can be very troublesome at depths less than 5000 feet, and can damage the surface equipment if not controlled. Mud line pulsation dampeners have been very effective in preventing damage to the surface equipment when using the drill at shallow depths. At deeper depths the drill pulsations are effectively dampened out by the mud column. Down-the-hole pulsations set up by the drill have not been controlled and may cause difficulty with heaving shale formations, where the pulsations working against the face of the shale formation may cause it to fall. Usually where the drill is to be used below an open shale section, the mud viscosity is raised above normal before the percussion run to help carry out any falling shale. The greatest difficulty is encountered on the first run with the drill, as in each succeeding run the quanity of shale that is shaken down becomes less, and the hole will eventually stabilize.

Drilling an undergauge hole in hard formation has been the most serious operational problems to date. The tapered hole is a result of "pinching in" of the bit cones from the impact of the hammer, both in drilling new hole and in reaming to bottom with the drill in operation. The problem is very serious since drilling with an undergauge bit means that the following bit must ream, which also produces undergauge or tapered hole. As a result, the condition may quickly develop where it is impossible to reach bottom with a full size bit. One method used to control this difficulty has been to make a conventional reaming run after three or four percussion runs to dress out the hole. However, this adds extra time and cost since no new hole is drilled on these reaming runs. A more recent method has been to ream to bottom where necessary with the drill inoperative. Several devices have been tested to render the drill inoperative, and the latest has been to braze several soft metal "tips" on the mouth of the control sleeve to keep the ball off the seat and prevent drill operation. These tips will wear away in 30 minutes or an hour, which is sufficient time for a short reaming run.

Summary

The percussion drill has been successfully developed into a dependable oil field tool, and has a proven application in drilling hard formations, and "crooked hole" sections. The third application of the drill — limestone drilling — is still in the development stage but initial results are very encouraging. In "crooked hole" work the drill is not a cure for excessive deflection, but can be used economically to maintain penetration rates and prevent excessive deflection. Development of the drill and percussion bits has reached the point where the available bits will not stand up under the maximum power of the drill, and future work will be along the lines of lighter hammer weights with the present bit designs until bits are developed to utilize fully the power available.

The successful application of rotary percussion drilling in the oil industry is new, and much remains to be done before a true picture is obtained of the limits and capabilities of percussion operation.

ACKNOWLEDGMENTS

The author wishes to express thanks to Shell Oil Company for permission to publish this paper, and to the firms and individuals that contributed to the development of the percussion drill.

BIBLIOGRAPHY

[1] Experiments in Rotary Percussion Drilling by W. E. Harpst and E. E. Davis, Shell Oil Company, Southwestern District API Meeting, Galveston, Texas, March, 1949.

[2] Rotary Percussion Drilling by P. L. Guarin and H. E. Arnold, Shell Oil Company API-29th Annual Meeting, Chicago, November, 1949.

[3] The Bassinger Rotary Percussion Drill by Robinson Brown. The Petroleum Engineer, December, 1950.

[4] Rotary Percussion Drilling by Ross Bassinger. Oil and Gas Journal, October 12, 1950.

About the Author

J. A. WANAMAKER, drilling engineer for Shell Oil Company, was graduated from Louisiana State University in 1947 with a B. S. degree in Mechanical Engineering. As a fighter pilot, Wanamaker was assigned duty in the Pacific Theatre during World War II. He has been employed by Shell since 1947 as a junior engineer in the Houston Exploration and Production Research Laboratory and has been drilling engineer in the West Texas area for the last 2½ years.

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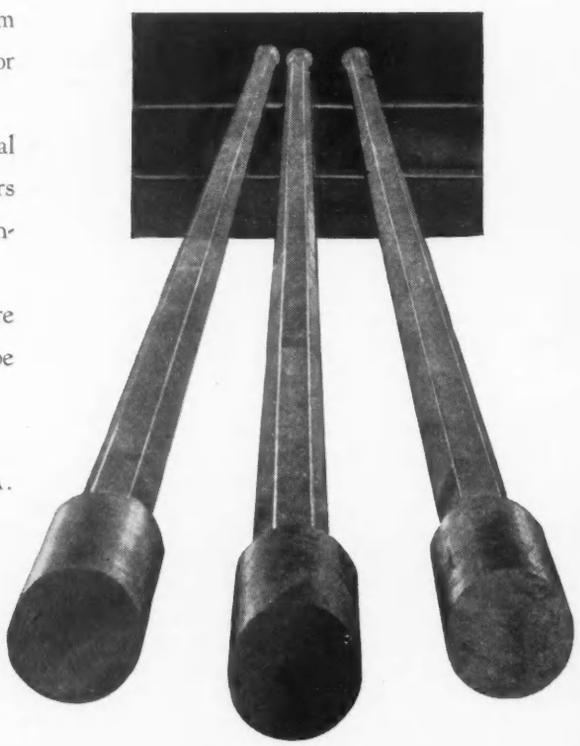

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Investigation of Torque Converter Drives On Mud Pumps

By

DAVID F. TOOMEY
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and

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THE COMPARATIVE MERITS and operational characteristics of the steam and power pump are reviewed. The authors have found that the fluid flow pulsation, especially peculiar to power pumps, can be reduced 50 percent by the installation of torque converter drives. The installation was found to improve the pump performance to a point wherein the rated pressure of the equipment was increased 25 percent. This paper was presented at the 1951 Spring Meeting of the Pacific Coast District, Division of Production, American Petroleum Institute in Los Angeles.

FOR many years the direct-acting steam-driven slush pump was the most popular type for use in the oil fields; however, as improvements were made in the construction of power slush pumps and a better understanding of their operation was developed, it became competitive economically as well as operationally to the steam pump. Unfortunately, operators failed to recognize that the power pump was an almost entirely different piece of equipment which brought with it completely altered fluid flow characteristics. Until these differences have been recognized and fully understood, the operator cannot expect to replace the direct-acting steam pump with a power pump and obtain completely satisfactory performance.

The fluid ends of both types of pumps are alike, generally being of the reciprocating, double-acting type which includes a liquid cylinder, piston and rod, suction and discharge valves, and piping connections for the suction and discharge chambers. However, in type of drive the pumps differ completely. The driving mechanism for the direct-acting steam pump generally consists of a conventional slide-valve engine in which the steam piston is directly connected to the fluid piston by the piston rod. In contrast to this the power pump is powered by an external prime mover through a drive system consisiting of reduction gears, crankshaft, crosshead, and connecting rod.

The two pumps with their radically different types of drives have correspondingly very different characteristic flow curves. Figure 1 shows the flow characteristics of a direct-acting duplex steam pump, which is actually two pumps interconnected in such a manner that the motion of the piston rod of one operates the steam valve of the other. Theoretically, a direct-acting steam pump maintains steady flow and a constant pressure, and because it is not greatly affected by the influence of the inertia of moving parts, the actual flow curve conforms closely to the theoretical curve.

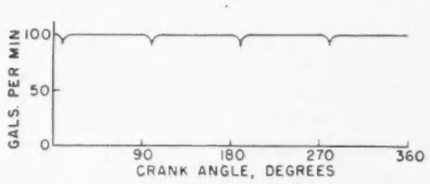

FIGURE 1. Flow characteristics for a double-acting duplex steam-driven pump.

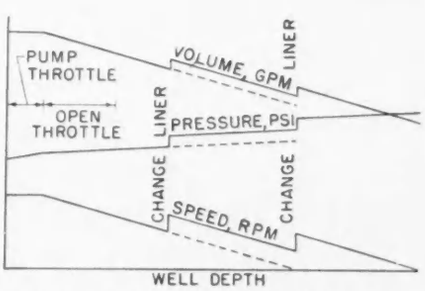

FIGURE 3. Performance characteristics of a direct-acting steam pump as a function of depth.

In contrast, the power pump has certain flow and acceleration characteristics which are modified by the details of design, and which are not changed by the pumping system. Whereas the direct-acting pump adapts itself to a considerable extent to the characteristics of the pumping system, a power pump has no such flexibility and labors to make the flow in the entire system correspond to its particular flow pattern. Figure 2 shows a typical flow curve for a duplex double-acting power pump. The flow pattern resembles a sine plus cosine curve, but is distorted due to the effect of angularity of the moderate-length connecting rod and the volume of fluid displaced by the piston rods. The amount of this distortion depends upon the ratio of the length of connecting rod to the length of crank, and the difference between head end and crank end piston areas resulting from the piston rod consideration. This distortion effect causes the periodic variations in the com-

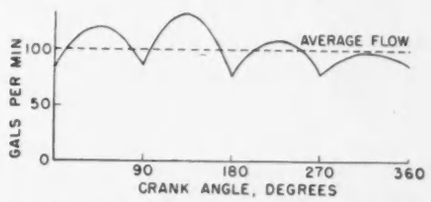

FIGURE 2. Flow characteristics for a double-acting duplex power pump.

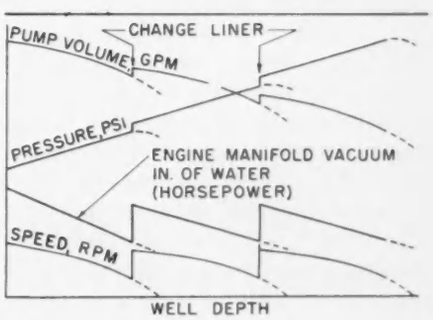

FIGURE 4. Performance characteristics of a power slush pump as a function of depth.

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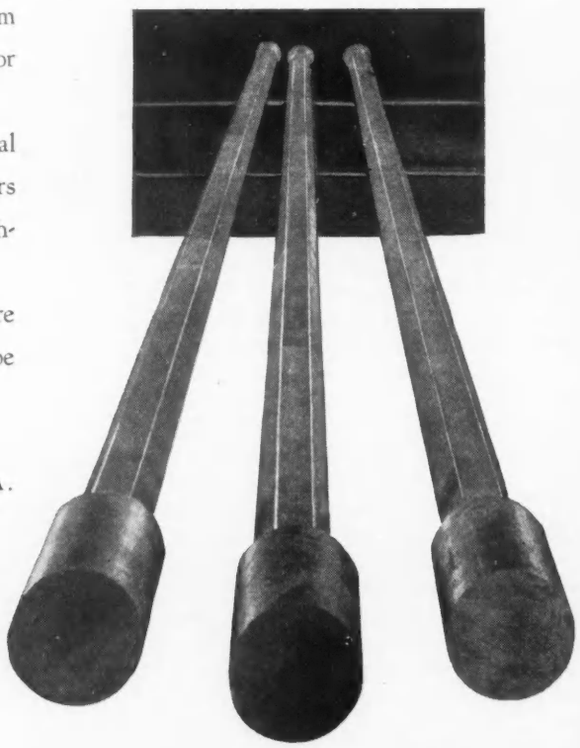

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Investigation of Torque Converter Drives On Mud Pumps

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Mechanical Research Section
Shell Development Company

THE COMPARATIVE MERITS and operational characteristics of the steam and power pump are reviewed. The authors have found that the fluid flow pulsation, especially peculiar to power pumps, can be reduced 50 percent by the installation of torque converter drives. The installation was found to improve the pump performance to a point wherein the rated pressure of the equipment was increased 25 percent. This paper was presented at the 1951 Spring Meeting of the Pacific Coast District, Division of Production, American Petroleum Institute in Los Angeles.

FOR many years the direct-acting steam-driven slush pump was the most popular type for use in the oil fields; however, as improvements were made in the construction of power slush pumps and a better understanding of their operation was developed, it became competitive economically as well as operationally to the steam pump. Unfortunately, operators failed to recognize that the power pump was an almost entirely different piece of equipment which brought with it completely altered fluid flow characteristics. Until these differences have been recognized and fully understood, the operator cannot expect to replace the direct-acting steam pump with a power pump and obtain completely satisfactory performance.

The fluid ends of both types of pumps are alike, generally being of the reciprocating, double-acting type which includes a liquid cylinder, piston and rod, suction and discharge valves, and piping connections for the suction and discharge chambers. However, in type of drive the pumps differ completely. The driving mechanism for the direct-acting steam pump generally consists of a conventional slide-valve engine in which the steam piston is directly connected to the fluid piston by the piston rod. In contrast to this the power pump is powered by an external prime mover through a drive system consisiting of reduction gears, crankshaft, crosshead, and connecting rod.

The two pumps with their radically different types of drives have correspondingly very different characteristic flow curves. Figure 1 shows the flow characteristics of a direct-acting duplex steam pump, which is actually two pumps interconnected in such a manner that the motion of the piston rod of one operates the steam valve of the other. Theoretically, a direct-acting steam pump maintains steady flow and a constant pressure, and because it is not greatly affected by the influence of the inertia of moving parts, the actual flow curve conforms closely to the theoretical curve.

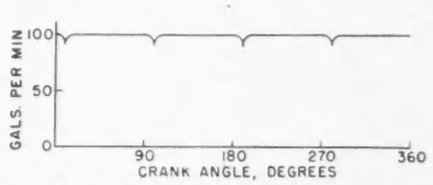

FIGURE 1. Flow characteristics for a double-acting duplex steam-driven pump.

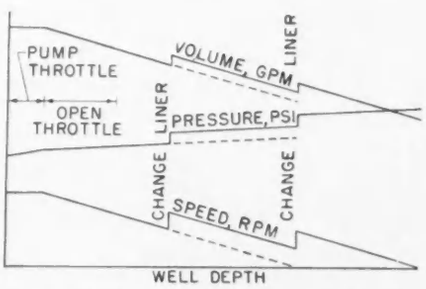

FIGURE 3. Performance characteristics of a direct-acting steam pump as a function of depth.

In contrast, the power pump has certain flow and acceleration characteristics which are modified by the details of design, and which are not changed by the pumping system. Whereas the direct-acting pump adapts itself to a considerable extent to the characteristics of the pumping system, a power pump has no such flexibility and labors to make the flow in the entire system correspond to its particular flow pattern. Figure 2 shows a typical flow curve for a duplex double-acting power pump. The flow pattern resembles a sine plus cosine curve, but is distorted due to the effect of angularity of the moderate-length connecting rod and the volume of fluid displaced by the piston rods. The amount of this distortion depends upon the ratio of the length of connecting rod to the length of crank, and the difference between head end and crank end piston areas resulting from the piston rod consideration. This distortion effect causes the periodic variations in the com-

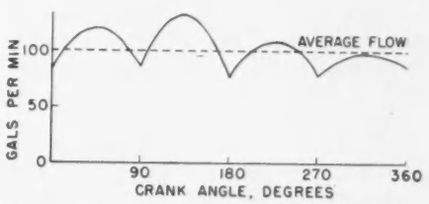

FIGURE 2. Flow characteristics for a double-acting duplex power pump.

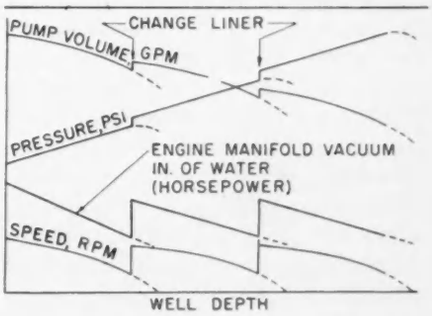

FIGURE 4. Performance characteristics of a power slush pump as a function of depth.

bined flow curve, which has the four peaks: medium, high, medium, and low.

In analyzing the pressure fluctuations inherent in the power pump it is usually found that the rate of change rather than the amount of change of fluid flow is responsible for the pulsations. Since the maximum rate of change of fluid flow is proportional to the product of the pump speed and the greater slope of the combined flow curve, variations of either will affect the pressure pulsations accordingly. This is accomplished in the triplex pump by smoothing out and reducing the maximum slope of the combined flow curve with an additional cylinder.

Now comes an important concept which is seldom recognized by the operators of power slush pumps. For two pumps having different size liners and operating at the same output, the one with the smaller size liner and higher speed will have considerably increased pressure pulsations. It has the same total flow variations as the slower pump with the larger liners, but with the difference that it takes place more frequently. Thus the rate of change of fluid flow is greater for the smaller higher speed pump and consequently the fluctuations in pressure will be greater.

Power Pumps

Power pumps usually follow much the same pattern of application as the direct-acting steam pumps. Similarity of operation between the two types of pumps is illustrated in Figures 3 and 4. As the well depth increases with a corresponding increase in pressure, each pump is forced to slow down until at some depth the liner must be changed to a smaller size or the pump will stall. With each change in liner size the pump again speeds up, and in the case of the power pump, each increase in speed is accompanied by a corresponding increase in magnitude of pressure pulsations. Application of mechanical transmissions to power slush pumps has offered the advantage of operating at slower speeds while retaining the same size liner without stalling the pump. Another more recent development has been the application of hydraulic torque converters, which for many years were considered unadaptable to slush pumps. However, a better understanding of converter application and mechanical improvements in the power slush pump have eliminated many of the earlier objections. The converter on a slush pump offers several valuable features, probably the most familiar being that it permits the engine to operate at its most efficient speed while the pump automatically adjusts itself to maximum discharge volume, thus obtaining relatively constant hydraulic horsepower at its discharge.

Recently, a test was conducted to determine if a torque converter drive would reduce power pump pressure pulsations by a comparison with a conventionally driven pump equipped with a necessarily smaller size liner. The test was conducted at a rig drilling 6¼-inch hole with 3½-inch outside diameter internal-flush drill tubing at a depth of 6063 feet. Seven-inch, 26-pound-per-foot casing had been set at a depth of 5725 feet. The No. 1 pump, which had a 7¼-inch liner and 16-inch stroke, was rated at 300-hydraulic horsepower and was driven through a single-stage torque converter and chain drive by a 12-cylinder twin-diesel engine rated at 290 combined brake horsepower. The No. 2 pump, which had a six-inch liner and 14-inch stroke, was rated at 280 hydraulic horsepower, and was driven through a clutch power takeoff and V-belts by two six-cylinder gas engines rated at 180 bhp each. Unfortunately, the two pumps were not alike either in length of stroke or prime mover. However, in a practical sense the conditions of the test were quite representative of an actual drilling situation. The necessity of using six-inch liners in the No. 2 pump was probably indicative of the size liner that would have been required by the No. 1 pump had it been conventionally driven at that depth. This situation is illustrated in Figure 5, which compares the performance curve of a converter driven pump with a single size liner to that of the same pump conventionally driven with several size liners.

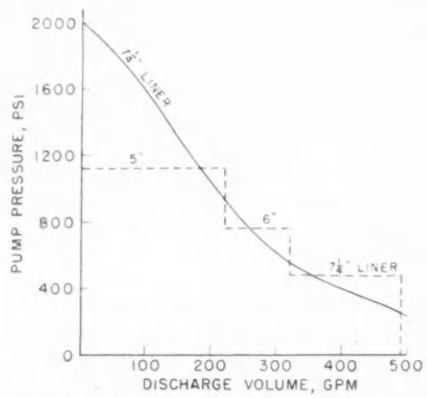

FIGURE 5. Performance curves for a 7¼-by 12-inch power slush pump with a torque converter drive and one size liner, as compared to the same pump with a conventional drive and various size liners.

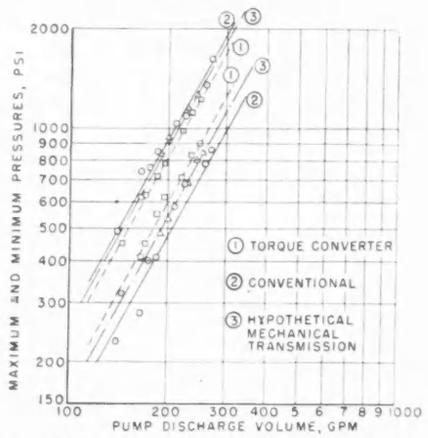

FIGURE 6. Curves showing maximum and minimum pressures for a slush pump using a conventional drive, and one using a torque converter and hypothetical mechanical transmission.

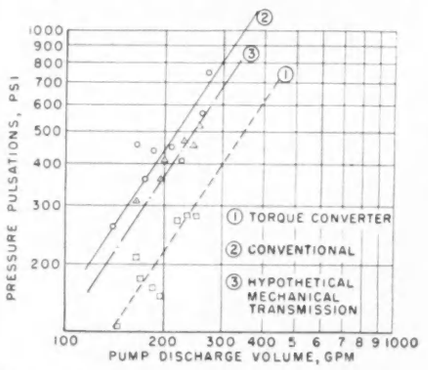

FIGURE 7. Curves showing pressure pulsations for a slush pump using a conventional drive, a converter and hypothetical transmission.

Pressure Pulsation

From Figure 6 it is apparent that the pressure pulsations of the converter driven pump were considerably reduced, because both the maximum and minimum pressures for this pump represented by the lines marked (1), fall within corresponding pressures for the conventionally driven pump, represented by the lines marked (2). The amount of this reduction, represented by the vertical distance between the variation lines marked (1) and (2) in Figure 7, is approximately 50 percent. However, had the No. 2

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pump been operating with a 16-inch instead of a 14-inch stroke, the slower speed probably would have reduced this figure somewhat. Nevertheless, the reduction of pressure pulsations was appreciable and led to an attempt to predict what the reduction in variation would have been if the No. 1 pump had been equipped with a mechanical transmission. In this connection, a theoretical analysis was developed by means of which maximum and minimum pressures, represented by the lines marked (3) in Figure 6, were calculated for the No. 1 pump assuming it was equipped with a mechanical transmission instead of a converter. As anticipated, these curves fell inside those for the conventional drive and outside the curves for the converter drive. Figure 7 shows that the pressure variations of the conventionally driven pump could have been reduced by 16 percent with the application of a mechanical transmission, as opposed to the previously demonstrated 50 percent reduction obtained by the converter drive.

The reduction of the pressure pulsations corresponds to the general alteration of the pressure curve when a converter drive is applied to a slush pump. The pump is no longer required to conform without variation to constant speed characteristics of the prime mover, but may, with the elimination of positive mechanical drive, develop relatively independent operating characteristics of its own. What happens is that the individual operational cycle of the crank is changed from a constant to a varying angular velocity. This is illustrated to good advantage in Figure 8 in which it is evident by comparison of the manner in which the pressure curve of the converter driven pump is altered. Mamixum pressures are lowered and minimum pressures are raised, while the duration of comparable parts of the cycle is not constant. In general, the pressure curve for the conventionally driven pump is characterized by peaked maximum pressures and a sharply fluctuated rise and fall of pressures between peaks, while that for the converter driven pump is a much smoother curve characterized instead by rounded maximum pressures and a gentle rise and fall of pressures between them.

If one considers the effects of torque converter drives on stresses in parts of the engine and drive mechanism, it will be noted that appreciable mechanical improvements are obtained, accruing from at least two different causes:

- Reductions in peak pressures obviously reduce peak stresses in the parts.
- Smoothing of the pressure curves reduces shock loads and high momentary accelerations, and will appreciably improve fatigue life of parts.

The reduction of pressure pulsations will permit raising of the rated pressures on the fluid end of the pump. This can be illustrated further as follows: Assume that a certain part in the pump drive such as a gear is designed on fatigue limit and subjected to stresses which are directly

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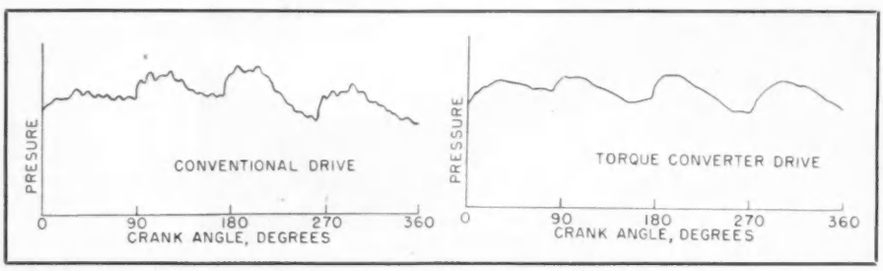

FIGURE 8. A comparison of measured pressure traces of two power slush pumps, one using a conventional drive and the other a torque converter.

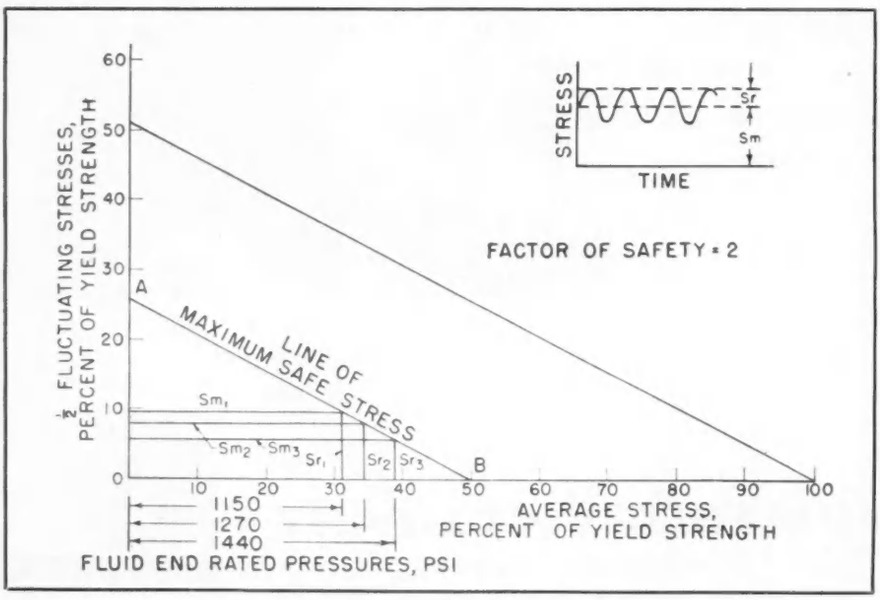

FIGURE 9. Curves based on Timoshenko analysis demonstrating the calculation of new rated pressures for a slush pump.

About the Authors

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ERNEST G. CHILTON secured a B. S. degree from the Massachusetts Institute of Technology in 1940; completed the requirements for an M. S. degree in aerodynamic engineering at the California Institute of Technology in 1941, and in 1947 he received his Ph. D. degree in mechanical engineering from Stanford University. His affiliation with Shell Development Company began in 1947. At the present time, Chilton is in charge of the Mechanical Engineering Research Section at Emeryville, Calif.

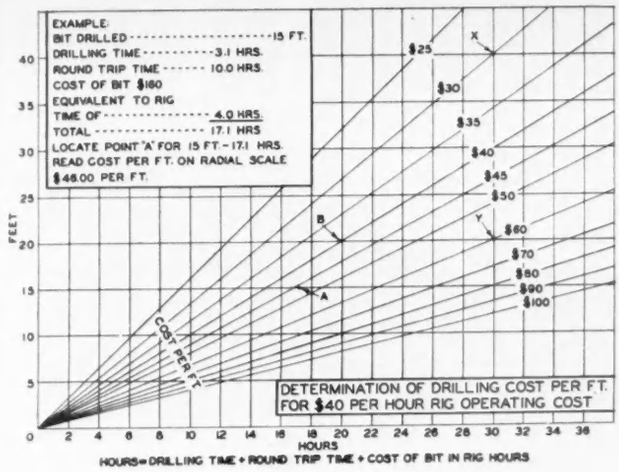

FIGURE 1

ANALYSIS OF Rock Bit Performance Data

By HENRY B. WOODS
Assistant Director of Research Engineering
Hughes Tool Company

THIS ARTICLE discusses a graphic method of determining the proper time to remove a rock bit from service. In further qualifying the method, the author lists the difficulties which may be encountered in field application of the technique. Although the method is not entirely perfect, it does provide a reasonable yardstick for the economic determination of the proper time to pull a rock bit.

MANY erroneous conclusions have been drawn from too hurried attempts to analyze rock bit performance data. It is the purpose of this article to offer a graphical method that may be used to evaluate such data and to point out difficulties which may be encountered in attempting to draw conclusions from the results.

A bit log similar to that shown in Table 1 is often used to compare the drilling efficiency of two types of rock bits. It may be seen that three bits of Type A were run alternately with two bits of Type B. The log indicates that the formation was relatively uniform. Bits A averaged 15 feet in 3.1 hours; Bits B averaged 20 feet in 5.9 hours. Which bit made the better runs? Assuming, of course, that both bits drilled good usable hole, the bit which drilled hole at lower cost per foot is the better bit. A comparison of the average footage and average drilling rate will ordinarilly show this, but in the above case where Bit B drilled somewhat more hole at lower drilling rate, it is not obvious which bit drilled hole at lower cost.

The use of the product of footage and drilling rate as a sort of merit number is sometimes used. This is fairly satisfactory in certain types of drilling, but it is almost useless in soft, nonabrasive digging where drilling hours may be very long or in hard extremely abrasive digging where drilling hours may be very short.

In any universal procedure for comparing bit runs, rig operating cost, the cost of the bit and the round trip time must be considered. The most direct method is to calculate the cost per foot of hole with each bit. This may be determined by the well-accepted equation

$$C = \frac{B + R\,(T + t)}{F} \qquad (1)$$

where C = Drilling cost, dollars per foot
B = Bit cost, dollars
R = Rig operating cost, dollars per hour
T = Drilling time, hours
t = Round trip time, hours
F = Hole drilled by bit, feet

It is desirable to consider drilling time as only the time during which the bit is actually on bottom drilling. The round trip time should include the average time consumed from the moment one bit leaves bottom until drilling commences with the following bit. It should include time normally spent in circulating to bring cuttings to the surface or to condition mud, average down time due to minor repairs, the proper percentage of the time spent in cutting off wire line, and average reaming time. The value of rig operating cost used in the formula should be somewhat higher than the actual rig operating cost because we are not including miscellaneous down time when drilling, or down time due to major repairs when making trips.

Rig operating cost, bit cost and round trip time will vary widely with size of rig, size and depth of hole, and other conditions. To demonstrate equation (1) we have assumed $40 per hour rig operating cost, $160 bit cost, and ten hours round trip time. We may then calculate the cost per

Table 1

Type Bit	Depth Pulled Feet	Footage	Hours	Feet Per Hour
A	12305	12	2.7	4.45
B	12323	18	5.4	3.33
A	12340	17	3.2	5.30
B	12362	22	6.4	3.43
A	12378	16	3.4	4.70
Average for Bit A.....		15	3.1	4.84
Average for Bit B.....		20	5.9	3.39

Table 2

Feet on Bit	Hours Bit C	Hours Bit D
100	.7	.7
200	1.3	1.8
300	2.1	2.9
400	2.8	3.9
500	3.7	5.0
600	4.6	6.0
700	5.6	7.0
800	6.8	8.2
900	8.2	9.6
1000	10.0	10.9

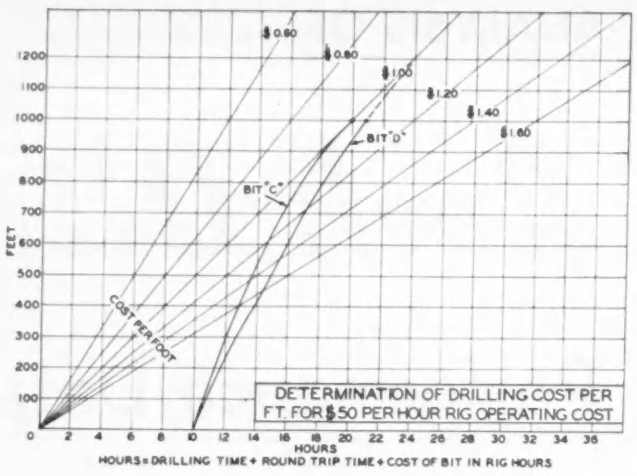

FIGURE 2

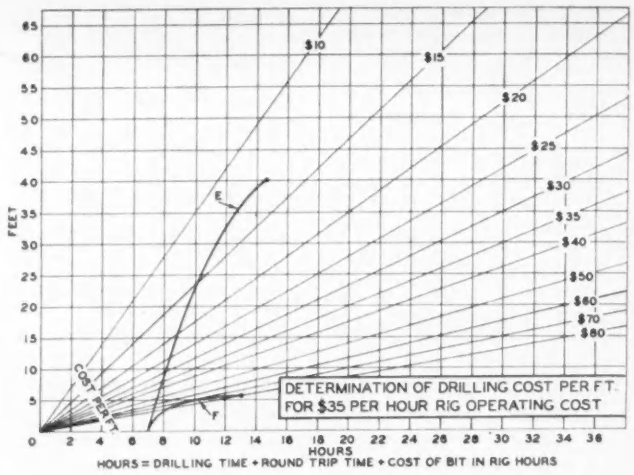

FIGURE 3

foot for the average values on Bits A and B in Table 1 as follows:

$$\text{For Bit A, C} = \frac{\$160 + \$40\ (3.1 + 10)}{15\ \text{Feet}}$$

$$= \$46 \text{ per foot}$$

$$\text{For Bit B, C} = \frac{\$160 + \$40\ (5.9 + 10)}{20\ \text{Feet}}$$

$$= \$40 \text{ per foot}$$

A graphical method for determining cost per foot is shown on Figure 1. A point is located for footage drilled on the vertical scale and drilling time plus round trip time plus cost of bit in rig hours on the horizontal scale. Cost per foot on the radial scales can then be read. The corresponding points for Bits A and B are indicated on the chart. It may be seen that the drilling cost for each bit is the same as calculated by the formula. We favor the use of this graphical method. The results are sufficiently accurate and the chart also has other uses as will be explained later.

Preparation of Charts

The charts may be prepared as follows:

Use a vertical scale for bit footage and a horizontal scale for hours that will cover the range of footage and hours for the bits being compared. (It must be remembered that the hours scale includes round trip hours and cost of bit in rig hours as well as drilling hours.) For a rig operating cost of R dollars per hour, the radial line representing C dollars per foot drilling cost is drawn through the origin and a point having coordinates C on the horizontal scale and R on the vertical scale.

For example, Figure 1 is drawn for a rig operating cost of $40 per hour so the radial line for a cost of $30 per foot goes through a point 40 feet up on the vertical scale and 30 hours over on the horizontal scale. (Point X on Figure 1.) The $60 per foot line should go through a point 40 feet up on the vertical scale and 60 hours over on the horizontal scale. However, the hours scale does not go to 60 and the $60 per foot line is located by drawing it through a point 20 feet up and 30 hours over which bear the same ratio as 40 to 60. (Point Y on Figure 1.)

In any comparison between two types of rock bits it is necessary to study carefully conditions under which each bit is run. A hard formation bit may initially drill more slowly than a soft formation bit, but stay in the hole enough longer to justify its use. Conversely, a soft formation bit may drill fast enough initially to justify its use even though it wears out sooner. It should be determined if each has been left in the hole approximately the proper time for greatest economy. This has been discussed by Yeatman [1].

Yeatman's Method

Yeatman's method consists in plotting footage vs hours during the life of each bit and then determining if the bit were pulled at the proper point for lowest cost per foot of hole. To do this, the cumulative time at different footages during the life of each bit would be needed. A possible set of such data is shown in Table 2, and is plotted on Figure 2. Fifty dollars per hour is taken as rig operating cost and ten hours for the sum of the round trip time and the bit cost expressed in rig hours. It may be seen that cost per foot is about $1 with Bit C and about $1.05 with Bit D. It appears that drilling cost would not have been reduced if Bit C had been run longer for the drilling curve is just about tangent to the $1 per foot line. However, Bit D was drilling at a good rate when it was pulled, and it seems probable that it might have continued drilling as shown by the dotted extension to its performance curve. We would conclude that this is not a fair comparison unless the appearance of Bit D after running indicated that cutting structure, gauge surface, or bearings were about ready to fail.

A similar curve prepared by the driller during the actual running of

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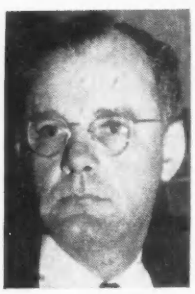
About the Author



HENRY B. WOODS, assistant director of research engineering for Hughes Tool Company, graduated from Rice Institute in 1928. In 1925, he was employed by Hughes as an analytical chemist and was promoted through the positions of chief chemist, testing engineer and laboratory director. His present assignment was made in 1946. He is a member of The API, AIME and the Houston Engineers Club.

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No. 3

Locating Physical Failures In Drill Pipe

By PAUL D. SHAFFER

Thompson-Carr, Inc.

A SIMPLE and efficient method of testing drill pipe for potential wash-outs is described. Of 111 failures, 99, or 89 percent, were discovered prior to the occurrence of a fishing job. Field application of the principle requires no special equipment as the actual test is conducted with mud pump pressure plus visual inspection of the drill pipe.

IT IS the primary interest of all drilling contractors to keep bits on bottom the maximum number of hours per day. Therefore, any time a fishing job results from drill pipe failure, the rig becomes nonprofit machinery; and in most cases, additional expenditures are incurred in the rental of fishing tools and specialized personnel to recover a fish. In the preparation of this article, all consideration is given the excellent services rendered by electronic drill pipe inspection companies, their diligent efforts and the results they obtain in assisting the drilling industry to detect defective drill pipe.

It is the policy of Thompson-Carr, Inc., to clean, straighten and test drill pipe by a number of means and processes in the hope of eliminating all possible drill pipe failures while the string is running in the hole. It has been our experience that, even with all of these precautions, failures occur in the form of washouts in a few days after an inspected string of drill pipe has been returned to service. These failures appear in the form of washout holes resulting from minute fatigue cracks developed in the drill pipe due to drilling conditions, trucking abuse, and careless handling.

Approximately 18 months ago, we presented the idea of developing a practical means of detecting a large percentage of drill pipe failures, prior to the occurrence of fishing jobs, to our supervisory personnel.

At a toolpushers' meeting each man was asked his suggestion for practical means of detecting these failures while pipe was drilling or during the process of making trips on the rigs. Several discussions were held subsequently on training drilling crews to detect failures in drill pipe without increasing the normal trip time on the rigs. It was decided to adhere to a few simple rules such as:

- Keep mud gauges in first-class condition and the visibility of mud gauges accessible to the drillers at all times.
- Keep weight indicators checked and properly operated.
- As each connection is made, the kelly is pulled high, leaving the preceding joint exposed in the derrick. The mud pump is started and pressures of from 400 to

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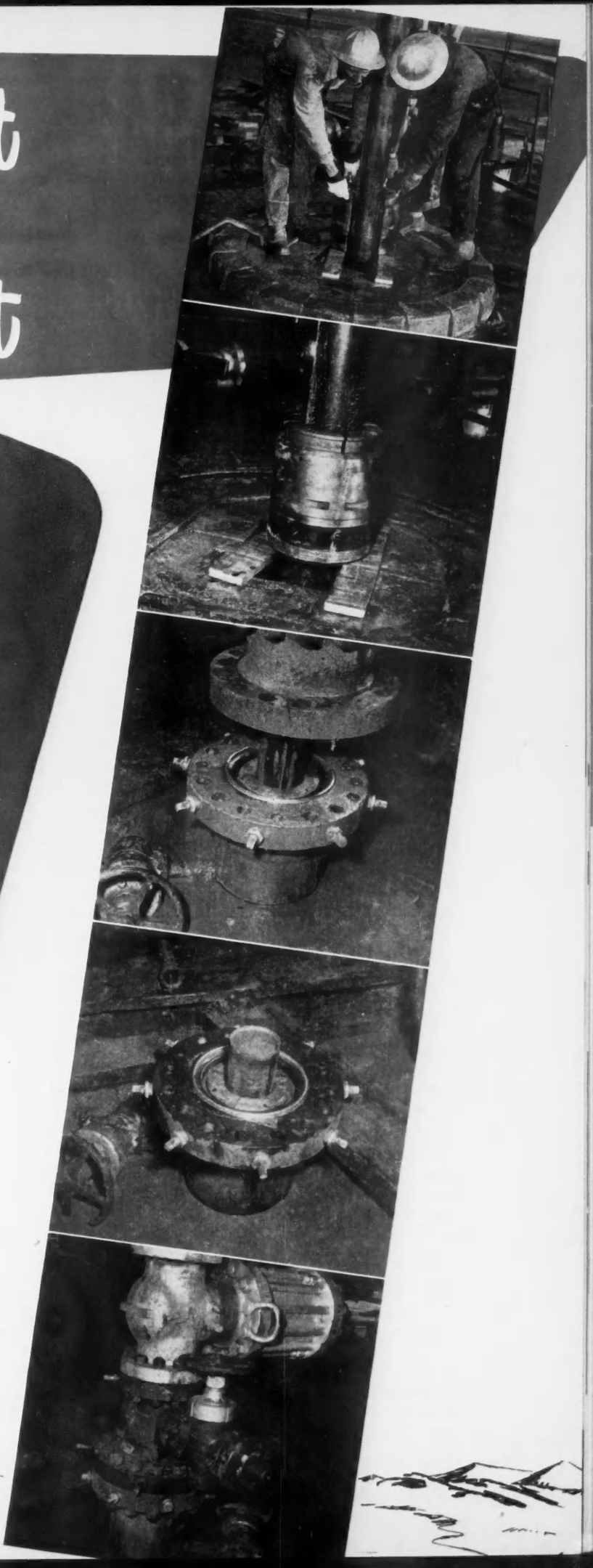


- Sealing element, slip bowl and slips are factory assembled as a single unit.
- Slips set evenly – heavy keys align slips so tops are level.
- Slips bite evenly – tooth pressure is uniform from top to bottom.
- The seal is automatic when casing weight is applied. No manual work required. Seal requires no field welding.
- Load capacity is twice as great as conventional slip hangers. Will swing full weight of longest strings without mashing pipe.
- Hazardous installation work in muddy and cramped cellar space reduced to minimum.

1400 pounds exerted on the drill string. If the last joint added has a small crack in the body of the pipe or tool joint, mud will escape and the point of failure can be marked. This joint is removed from the string.

- On all routine trips, a tightly fitting pipe wiper is employed from the first joint out until the bit is removed. Crew members are located around the rotary table so they can inspect the entire circumference of the drill pipe as it is removed from the hole.
- If a decrease in pump pressure occurs while running, the drillers are instructed to shutdown immediately. If the pump appears to be in good condition and there is still an indicated pressure drop as much as 200 pounds, drillers make trip immediately in search of leaks or cracks in the tool joint or the body of the pipe.

The above recommendations were gradually placed in practice on all rigs. Toolpushers advised the drillers of the procedure for detecting failures in pipe as outlined above. In turn, the drillers instructed crew members of the inspection practice to be observed on trips.

In order to account for drill pipe failures so it could be determined if the above practices were worth the time and effort, a report is prepared in connection with the API committee on drill pipe. The report includes size of the pipe, weight of the pipe, number of feet the pipe has made, pump pressure under which the pipe is operated, weight on the drill collars, the revolutions per minute of the rotary, and the size and depth of the hole. Sufficient space is available for a discussion of each failure.

Drill Pipe Report

Table 1 is an example of the form employed for recording drill pipe failures:

This drill pipe report, together with an inspection procedure, was instigated as a company practice in September, 1950. Table 1 shows the result of the drill pipe failure detection procedures.

The table shows a total of 111 drill pipe failures reported during a period of ten months covering a total of 11 rigs running daily and making 330,000 feet of hole. Of the 111 failures, 12 were not detected prior to a fishing job and 99 were detected before such failures caused fishing jobs in the hole. Based on an average cost of rig time and fishing tool rental, the 99 failures detected in drill pipe by the drilling crews resulted in a saving of many thousands of dollars.

It is felt that through the diligent efforts of personnel these few simple practices have more than paid for the time involved in training and instigating such practices.

The lesson here is that much time and money can be saved by sharing problems with field personnel.

Table 1

Drill Pipe Failure Report

Rig No. 6 Well: J. J. Hobbs Date: 7-18-51

PIPE DESCRIPTION:
Size and make 3½ Bottle-neck
Weight 13.30 Grade D
Total hours of service of string: 31,000 D. S. Co. mark: 3

DETAILS OF FAILURE:
Location of joint in string: 4970-4940
Location of failure in joint: 15.5' from pin and 14.1' from box
Nature of failure: Wash out and twisted off
Weight on bit and rotary speed: 35,000 — 80
Size of hole: 7⅞ Total depth: 8632

Remarks:
Drilling on bottom—Pump pressure 975 with 10.1 - 43 6.2 - 2/32. Salt water base mud.
Drill pipe at point of failure showed to be thin 3.40" O.D.—2.75" I.D. Wash out point ½" x ¼" x 2½". Joint was then at point of wash out.
J. P. Door, Pusher

Note: Under remarks give description of operation when failure took place such as drilling, reaming, pulling stuck pipe, and all information of interest. Also please note condition of pipe at "point of failure" such as thin walls, slip marks, corrosion pits, mill defects, etc.

Torque Converter Drives

CONTINUED FROM PAGE 192

proportional to the pressure pulsations in the pump. Then

$$S_{max} = k\,P_{max}$$

and

$$S_{min} = k\,P_{min}$$

where S_{max} and S_{min} are the maximum and minimum stresses in the part, respectively; P_{max} and P_{min} are the maximum and minimum pressures; and k is a constant. Then

$S_r = (S_{max} - S_{min})/2 =$ amplitude of fluctuating stresses

and

$S_m = (S_{max} + S_{min})/2 =$ mean stress

then

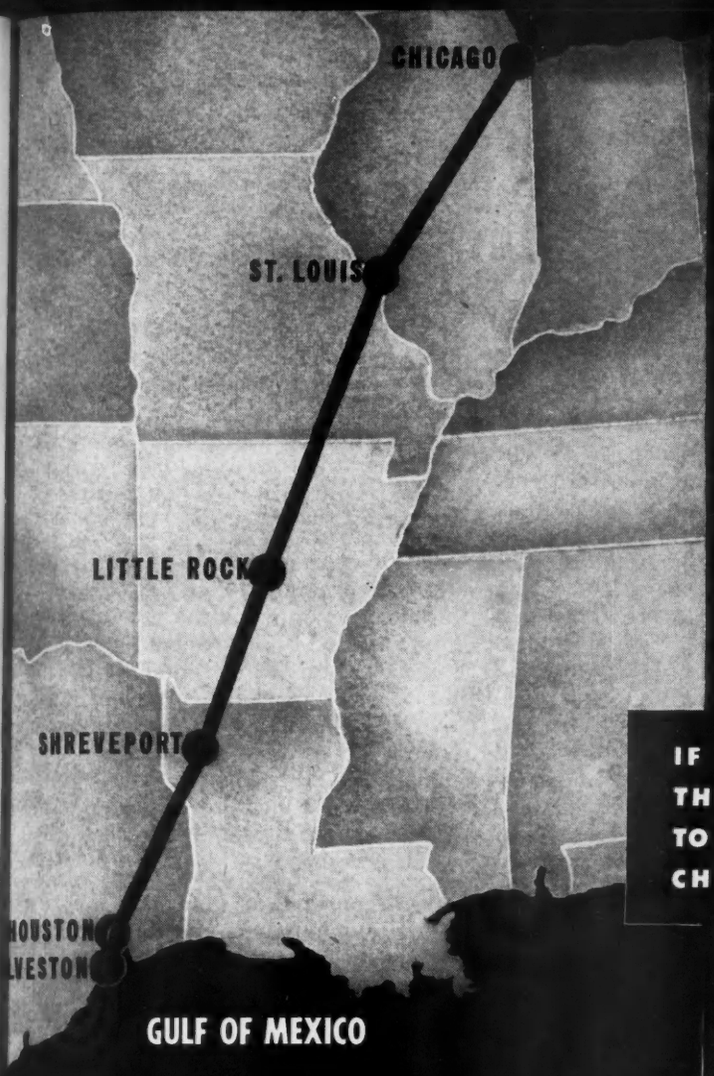
$$\frac{S_r}{S_m} = \frac{1 - S_{min}/S_{max}}{1 + S_{min}/S_{max}} = \frac{1 - P_{min}/P_{max}}{1 + P_{min}/P_{max}}$$

One can now, according to Timoshenko and MacCullough, plot a curve for computing a new maximum allowable fluid end pressure as in Figure 9. Operation under the line AB assures against the possibility of exceeding safe pump operation and shows that with a decrease in maximum pump speed and a corresponding decrease in pressure pulsations the fluid end rated pressure may be increased.

The values chosen for the ratio of P_{min}/P_{max} are those shown in Figure 6 and the corresponding ratios of S_r/S_m were calculated from them. If the type of steel for the gear is known, then curves similar to the one in Figure 9 can be plotted and the amount calculated by which fluid end pressures may be increased and yet maintain the same degree of safe pump operation. Values for the ratios of P_{min}/P_{max} were 0.515, 0.615, and 0.738, respectively, for the conventional, transmission, and converter drives. The corresponding ratios of S_r/S_m were, therefore, 0.320, 0.239, and 0.151 which resulted in values for S_m, the maximum safe average stress of the gear of 31.2, 34.4, and 38.9 percent of the yield strength. Therefore, the rated pressure of the conventionally driven No. 2 pump which was approximately 1150 psi using a six-inch liner could have been increased by the ratios of 34.4/31.2 and 38.9/31.2. This would have resulted in new rated pressures of 1270 and 1440 psi, respectively, for this pump had it been operating with larger size liners and at slower speeds made possible through the application of a mechanical transmission or a torque converter.

Conclusions

A direct-acting steam pump adapts itself to the characteristics of the pumping system, whereas a conventionally driven power pump has no such flexibility and labors to make the flow in the entire pumping system correspond to its particular flow



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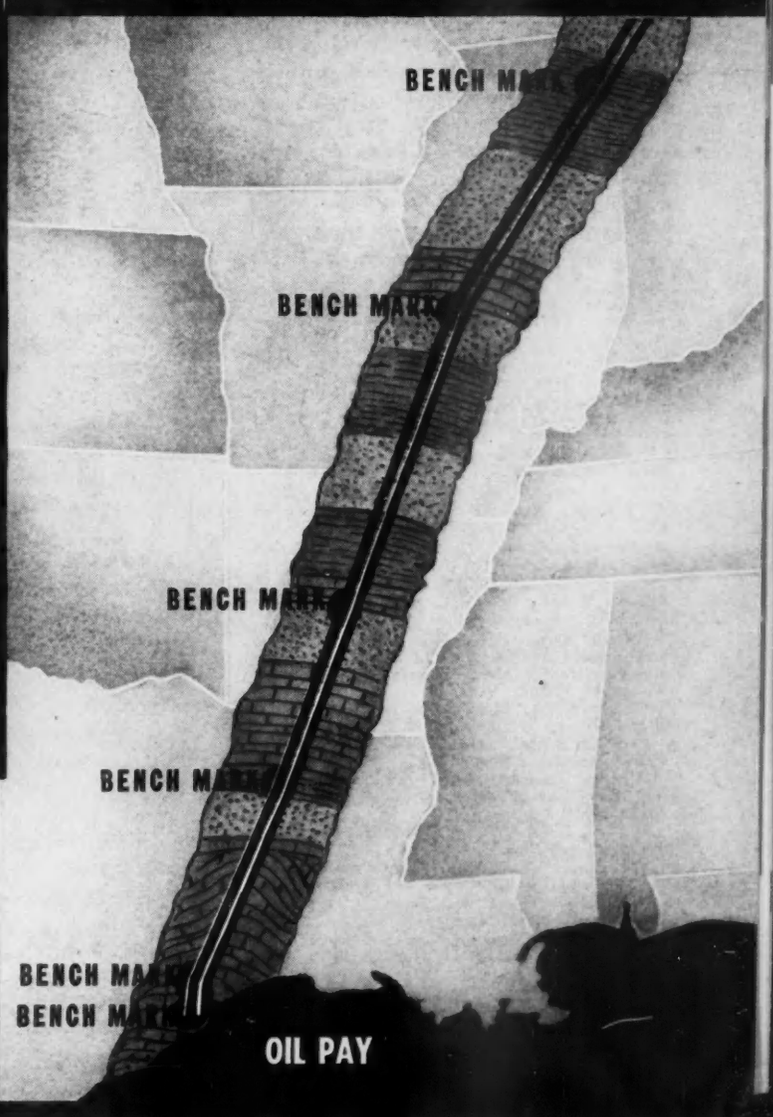

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pattern. However, with a torque converter drive, a slush pump acquires a new degree of flexibility and by the elimination of the positive mechanical drive it is no longer required to conform rigidly to the constant speed characteristics of the prime mover. Instead, new and relatively independent characteristics are developed resulting in an entirely altered pressure curve.

In a power pump pressure pulsations are a function of the rate of change of fluid flow, which, in turn, is proportional to pump speed. Therefore, reducing the speed of a power pump will correspondingly reduce pressure pulsations.

A torque converter was found to reduce pressure pulsations by approximately 50 percent when compared to a conventionally driven pump, which, for the particular situation considered, was operating at higher speeds as a result of the necessary reduction in liner size. A theoretical analysis, in which it was assumed that the converter was replaced by a mechanical transmission, showed that the pressure pulsations of the conventionally driven pump would have been reduced by 16 percent.

The reduction of pressure pulsations will permit raising the rated pressures of the fluid end of the pump. For a particular situation it was demonstrated that the rated pressure of a conventionally driven pump could be increased approximately 25 percent by the application of a torque converter, and by approximately 10 percent by the application of a mechanical transmission. Such increases illustrate the advantages to be gained by maintaining larger size liners and operating slush pumps at slower speeds.

BIBLIOGRAPHY

[1] S. Timoshenko and G. H. MacCullough, *Elements of Strength of Materials,* 2nd edn., 14-330, D. Van Nostrand Co., Inc., New York, 1940.

[2] R. Carter, I. J. Karassik, and E. F. Wright, *Pump Questions and Answers,* 1st edn., McGraw Hill Book Co., Inc., New York, 1949.

[3] F. A. Kristal and F. A. Annett, *Pumps,* McGraw Hill Book Co., Inc., New York, 1940.

[4] W. E. Wilson, *Positive-Displacement Pumps and Fluid Motors,* Pitman Publishing Corp., New York, 1950.

[5] *Pump Engineering Data,* 4th edn., Economy Pumps, Inc., 1946.

[6] W. B. Gibson, *Application Guide for Hydraulic Couplings and Torque Converters,* Twin Disc Clutch Co., Rockford, Illinois, 1950.

[7] H. A. Davis, "Hydraulic Torque Converters and Fluid Couplings for Oil Field Machinery," *The Petroleum Engineer,* September, October, and November 1949.

[8] K. N. Mills, "Fluid Drives for Drilling Rigs," *World Oil,* pp. 87-92, January 1951.

[9] H. L. Willke, "Mud Pump Selection," *The Petroleum Engineer,* pp. B32-B45, December, 1949.

[10] F. D. Graham, *Audel's Pumps, Hydraulics, and Air Compressors,* Theo. Audel & Co., New York, 1943.

[11] A. M. Greene, Jr., *Pumping Machinery,* John Wiley & Sons, New York, 1911.

[12] J. Zaba, "Power Slush Pump Characteristics," *The Oil and Gas Journal,* p. 81, January 8, 1948.

[13] J. Zaba, "Steam Slush Pumps," *The Oil and Gas Journal,* p. 121, December 1947.

[14] W. S. Crake, "Slush Pumps and Rotary," *The Oil and Gas Journal,* p. 143, July 28, 1945.

Rock Bit Performance Data

■ CONTINUED FROM PAGE 194

each bit will help him determine when to pull the bit. However, this should not be overemphasized, because in many cases it is hazardous to run a bit as long as would be indicated by such a curve.

Actually, being sure that the controllable conditions such as weight and revolutions per minute are correct for the particular bit on the particular formation is much more important. Figure 3 illustrates the importance of running the proper weight on the bit. A carefully controlled laboratory test was made in which two widely different weights were run on two 8¾-inch bits on Oriskany sandstone. This is a hard quartzitic sandstone found in Pennsylvania and neighboring states. Seven hours is assumed for round trip time plus the cost of the bit in rig hours; $35 per hour is assumed for rig operating cost. The two bits were identical 8¾-inch hard formation type. Bit E was run at 40,000 pounds weight, 60 revolutions per minute. Bit F was run at 20,000 pounds weight, 60 revolutions per minute. Bit E drilled 40 feet in 7½ hours at a cost of about $13 per foot. Bit F drilled six feet in six hours at a cost of about $80 per foot.

Table speed also has a definite effect on rock bit performance. On many formations drilling rate is proportional to table speed if weight on bit is held constant. The rate of wear of rock bit teeth and bearings increases very rapidly with increase in table speed. Also for the same indicated weight on bit, an increase in rotary speed may decrease the actual weight on bit. Rotary speed is often dictated by the speed with which the string can be rotated without too many drill collars or drill pipe failures. Too, the table is often geared in with the mud pump and table speed is governed to some extent by the amount of mud that must be pumped. In general, slow rotary speeds are best for hard and abrasive formations and higher speeds are best for softer, less abrasive formations.

There are other variables that affect rock bit performance but which, for various reasons, may not be directly changed. Some of these are rate of mud flow, physical properties of mud and proportion of indicated weight that is actually applied to bit. Variations in one or more of these variables may affect drilling cost more than a change in bit type. In any comparison of bit runs the possible effect of difference in these variables should be considered. They are discussed below.

- **Rate of mud flow:** In soft gummy formations an increase in mud flow well above that required for proper flushing of the hole may result in a definite increase in drilling rate. This is particularly true when drilling with heavy weight in formations that tend to ball up the bit.

- **Physical properties of mud:** It has been generally found that bit performance is improved as the drilling fluid approaches clear water. Actually, some operators have found that the use of air or gas as a flushing medium results in improved bit performance over clear water. The addition of materials which increase weight or viscosity or which lower water loss may decrease drilling rate as much as 50 percent.

- **Proportion of indicated weight actually applied to bit:** The actual weight on bit is the weight as shown by weight indicator less the weight that is borne by the wall of the hole. This will vary with the size and number of drill collars, the rotary speed, the condition of the wall of the hole, and the straightness of the hole. One case is recalled where drilling rate was 25 percent less on one hole which was six degrees off vertical as compared to an offset well that was within two degrees of vertical. Except for difference in straightness of the two holes there seemed to be no variation in conditions that might explain the difference in drilling rate. It is felt that on the first well a good percentage of the indicated weight was not delivered to the bit.

Summary

Determine actual cost per foot in comparing bit runs. This may be done graphically.

Be sure that each bit is pulled at approximately the proper time for best economy.

Be sure that controllable conditions are adjusted to give best economy for each bit.

Study the other conditions to see if they are consistent enough that the comparison is between two rock bit designs rather than between two operating practices.

REFERENCE

[1] Practical Utilization of Rate of Penetration Drilling Data, API Production Bulletin 225, Volume 21M [IV] (1940).

How to do it!

DRILLING HINTS

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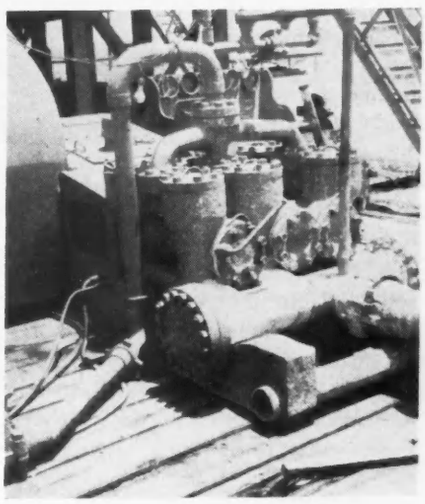
HOW TO—Unitize Mud Pump Discharge Line System

The practice of attaching complete mud discharge lines to the pumps on location to location moves can be eliminated through the installation of a permanent line bolted to the pump bed.

One operator has accomplished this time saving installation by fitting a 4 x 4-inch nipple in the discharge of the pump. Immediately above the short nipple is a full sweep ell connected to a similar fitting by means of an all-thread nipple. These fittings are made up so as to parallel the front face of the mud-end cylinder plate. In this position, the four-inch riser connected to the full sweep ell extends to the base of the pump very close to the bed.

A three-eighth inch plate is welded to the upper face of the I-beam skid and perforated with holes to accommodate a three-eighth inch U-bolt.



With the installation of this U-bolt, the entire pipe structure is held in a secure position not affected by vibration created by normal pump operation.

The base section of the riser is fitted with a preformed, welded ell connected to a four-inch hammer union. The four-inch line extending from the union is heated and formed to approach the twin pump manifold at the desired angle. The remaining pump, which is adjacent to the illustrated equipment, is rigged in a similar manner and the mud line manifold services both units.

With the application of this piping design, the operator has a high pressure system available that can be dismantled in short order. The latter operation is accomplished by breaking the hammer unions connecting the pump and the pipe manifold system. At this point the pumps and manifold are independent and ready for transport.

HOW TO—Add Water Slug to Drilling Fluid Suction

In low pressure areas, the occurrence of complete loss of circulation requires the immediate introduction of large quantities of fluid, which can be supplied through the installation of a water line in the pump suction. One operator has provided this facility by welding a four-inch collar in the base of the ten-inch mud pump suction line. A short nipple and hammer union are fitted immediately below the collar to facilitate rapid coupling of the line. The lower end of the union is fitted with a 12-inch nipple, an ell and an 18-inch nipple connected to a gate valve. The water line from the supply system is attached to the other side of the four-inch gate valve.

The introduction of large or small volumes of water into the hole or mud system is governed by the four-inch valve. In the event lost circulation is serious, it is possible to supply the hole with a four-inch stream of pressured water. If interrupted circulation is not a significant problem, the pump equipped with the water feed line can be employed as the mixing pump and the mud system will be increased by introducing into the pump suction for delivery through the system manifold, mud guns or mixing hoppers.

The installation will greatly expedite the process of building fresh pits of mud in that the water from the supply tank will be delivered to the mud tanks more quickly since the capacity of the large mud pump is much greater than the pumping ability of the usual water system pump.

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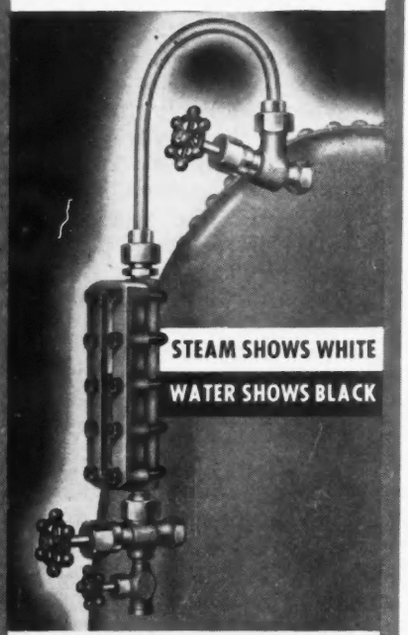

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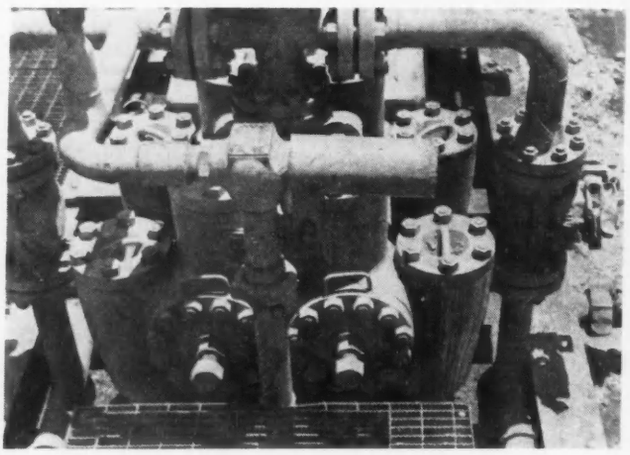
HOW TO—Safeguard Relief Valves



The danger of flying shear pins ejected from relief valves can be substantially reduced through the installation of a safety cap fabricated of a pipe nipple covered with a welded metal cap. The size of this protective cap will depend upon the outside diameter of the relief valve shear element. The inside diameter of the safety cap should allow sufficient tolerance not to hinder actuation of the relief lever or shear segment.

A two-inch strap iron brace is welded to the pipe cap and attached to the pump cylinder by means of a bolt fitted into a tapped hole. In this manner, the safety cap is anchored in place securely and may be removed conveniently if the shear segment of the relief valve requires service.

The importance of this shear guard is particularly emphasized when the relief valve is attached in a horizontal position. If the shear pin of the relief valve is positioned vertically, the importance of the protective cap is minimized. However, in either case, the installation of this protective device will assure complete control of the shear pin in flight after the relief valve has been tripped due to excessive mud pump pressure.

HOW TO—Take Cuttings at Shaker

The problem of removing formation cuttings from the shale shaker discharge can be overcome by positioning a mud gun adjacent to the shaker with the discharge end above the tray. This simple installation offers an obvious advantage when red bed or rapidly drilled shales are pumped to the surface and over the shaker. When this type formation is penetrated, it is often difficult to eliminate the clogging of the shaker tray by the rapid accumulation of cuttings.

This unit can be placed in service by extending the gun line from the mud tanks or pits to the shale shaker. A "T", made-up in a "running" position, allows the connection of a riser, gate valve and short nipple to adapt the mud gun. By positioning the gun a short distance from the shale shaker, it is possible to rotate the unit and, if necessary, gun the reserve pit parallel to the shaker unit and mud tanks.

The installation requires a very nominal investment in pipe and fittings. Amortization of the equipment may be foreseen in that it will be unnecessary for personnel to shovel cuttings from the tray when soft, rapidly drilled formations are penetrated.

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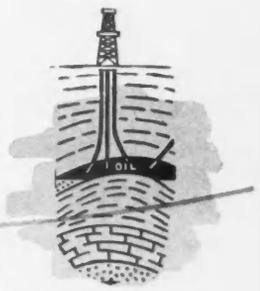

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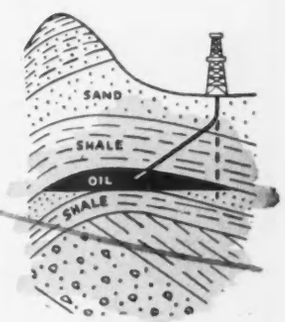

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Eastman engineers prepare carefully planned proposals in advance of the actual directional drilling work that is to be undertaken by the operator. These engineering suggestions are based upon vast experience in all major oil fields.

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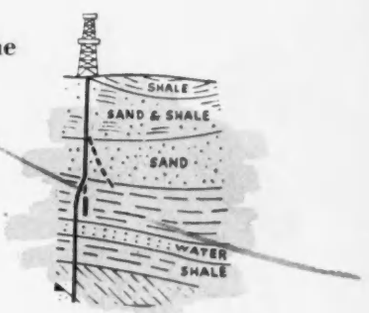

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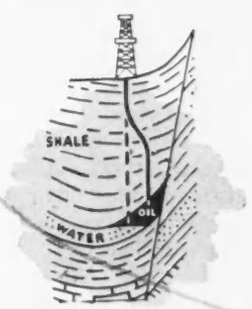
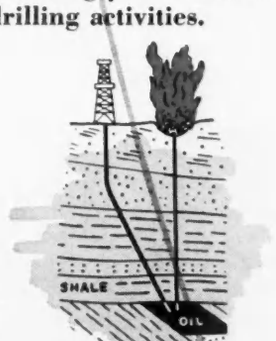


Redrilling Old Wells Profitably



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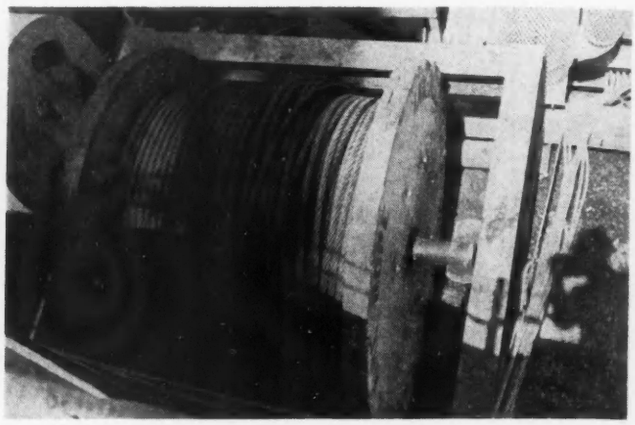
HOW TO—Rack Drilling Line Spool



The necessity of having to depend upon improvised drilling line spool racks can be eliminated through the fabrication of a support extension on the derrick or engine substructure. This permanent rack should be situated where it will be convenient to feed line from the spool through the blocks and finally to the drawworks drum.

This spool cradle, which is constructed of ten-inch substructure I-beam, consists of a welded box frame equipped with a hanging metal saddle retainer to afford support for the two-inch pipe axle extending through the line spool. The width of the spool cradle will depend upon the location of bracing members of the substructure to which the unit is bolted. The height of the unit is governed by the size spool usually purchased for rig line supply.

With this installation it is not necessary to depend upon a truck to maneuver line spools around a location, since the unit can be managed with the regular drilling line. Particularly adaptable for rigs often skidded, this inexpensive cradle may be permanently attached to the substructure for increased safety and more rapid handling of heavy drilling lines.

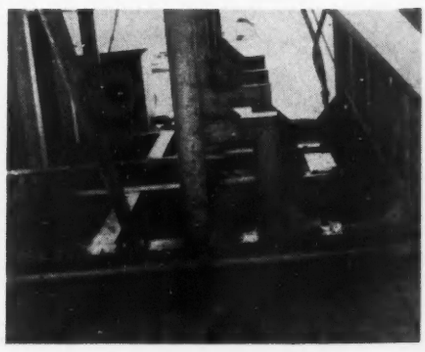
HOW TO—Add Skid Sill Adaptors

Simple, double channel skid sill retainers expedite the process of preparing and actually skidding a rig from location to location. The dimension of the retainer will depend upon the size beam generally employed in skidding a rig.

Construction of the retainers includes the laying-out and welding of an L-shaped channel iron element. For greater rigidity, two channel iron segments can be welded back to back. Triangular, three-eighth inch sheet metal shoes are welded to the section of the frame which will contact the substructure vertical supports and base runners. At this point, the frames, complete with the support shoe, are positioned against the substructure legs and securely welded. For complete maneuverability of the rig, each substructure unit must be equipped with the skid beam retainers.

The process of skidding a rig includes guiding the skid beam through the retainers and connecting wire rope required to move the rig. By extending the skid beam through the retainers, tension exerted upon the beam will be equally distributed across the lower part of the substructure and the possibility of damage will be reduced.

The utility of the skid sill adaptors offers additional advantage when a rig is moved on tracks. By elevating the complete rig, it is possible to position the tracks under the skid beam in preparation for a move.



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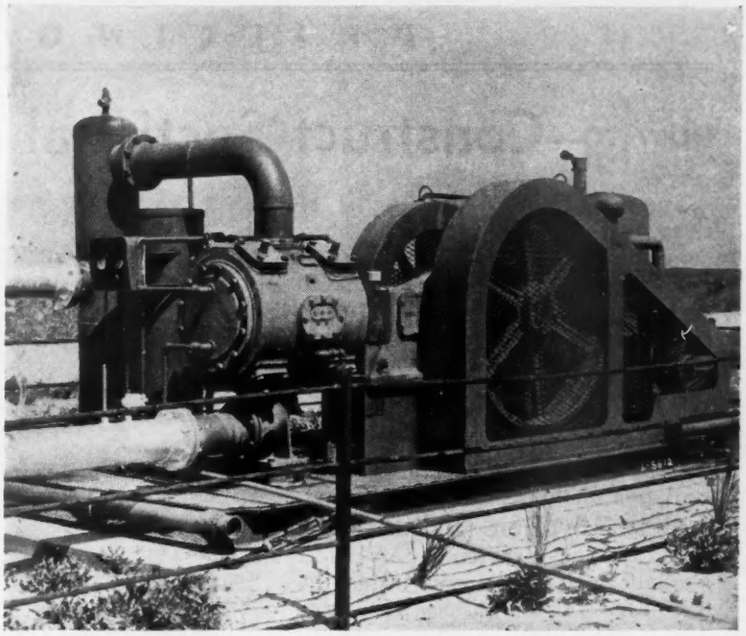

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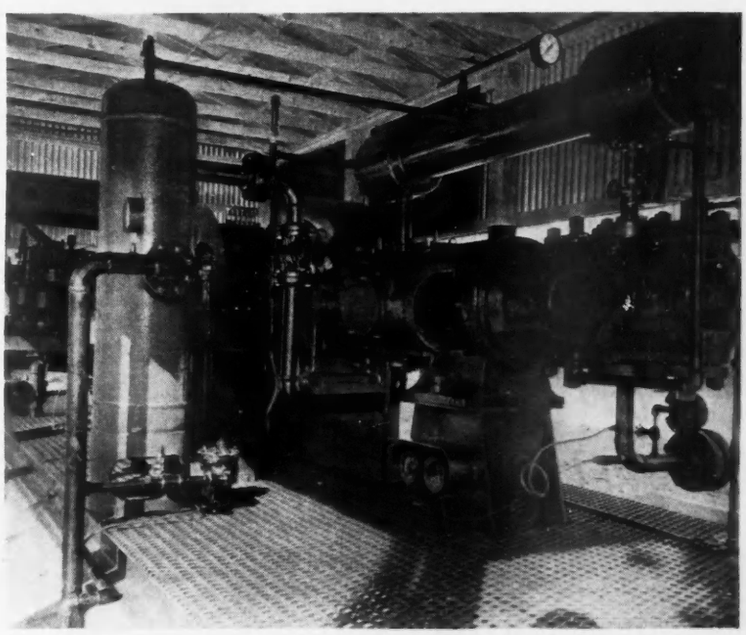

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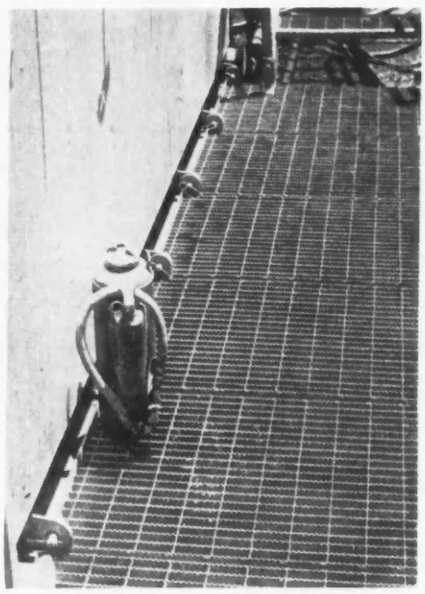
HOW TO—Construct Sectional Folding Walkway

Sturdy walkways, constructed of strap metal grille, can be attached conveniently between the tool house and mud pump units adjacent to each other on location. The basic requirement of this simple installation is locating the tool house and mud pump units in the same relative positions from location to location. If this rule is followed, no difficulty will be encountered in the field installation of these portable walkways.

Structural features of the walkways include the fabrication of a one-half inch angle iron frame the dimension of the proposed section. The frame should be assembled with the flat faces of the angle iron atop and alongside the unit. The welded structure is then securely reinforced with one-half inch angle iron bracing strategically located throughout the main segment. Installation of support elements depends entirely upon the type grille or expanded metal employed for the walkway surface. In the event heavy gauge grille is used, reinforcing requirements will be reduced to a minimum.



The walkway is secured to the side of the tool house by means of three-eighth inch steel lugs welded to the base sill. Each lug is perforated with a three-eighth inch hole to accommodate a clevis pin. Similar lug units are attached to the walkway frame in a position where, when the walkway is installed, clevis pins are guided through the matched lugs to form a hinge. One end of the clevis pin is peened and the other end drilled to accommodate a 3/16-inch safety pin. This lug and clevis pin installation is duplicated on the base sill of the mud pump.

For maximum portability, an additional set of lugs is welded to the side of the tool house in a position to match the walkway lugs when the entire unit is lifted against the side of the house for transport. When the walkway is maneuvered to this position, it is secured to the side of the tool house by sliding clevis pins through the walkway and tool house lugs. To insure secure anchorage of the walkway, the tool house lugs must be welded to strong, angle iron framing members of the house.

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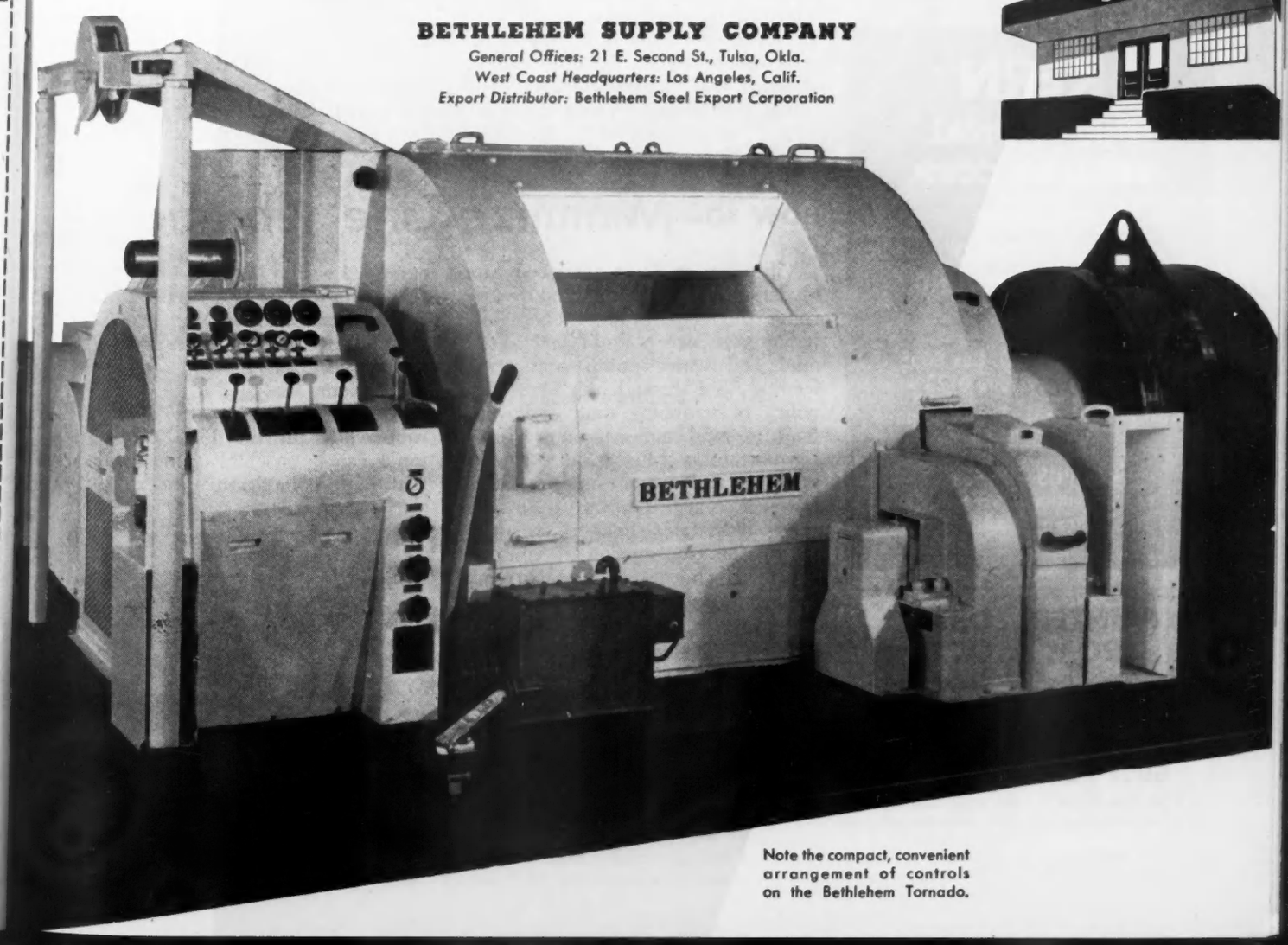

Note the compact, convenient arrangement of controls on the Bethlehem Tornado.

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HOW TO—Rig Preventer Controls

The blowout preventer pump and control panel can be installed permanently within the rig tool house to eliminate the necessity of handling the equipment as individual units when moving tools. The installation is efficient, simple and inexpensive—permitting the location of the control panel in a convenient position.

Primarily adaptable to rigs having the tool house located adjacent to the substructure and stairway leading to the floor, this unitization feature includes the construction of a three-inch pipe stand for the blowout preventer control pump. The pipe stand is bolted or welded to the floor and end of the tool house and the controls are attached immediately above the pump which has been anchored to the stand. Access to the pump control valves is provided by windows cut in the end panel of the tool house. The plug valve controls are so positioned that the lever adaptors extend through the opening in the tool house panel. Operation of the plug valve is possible by placing one handle, with the set screw removed, on one of the valve adaptors, or, handles can be attached and clamped to each individual plug valve. Valve stop positions are indicated by codes welded to the tool house panel.

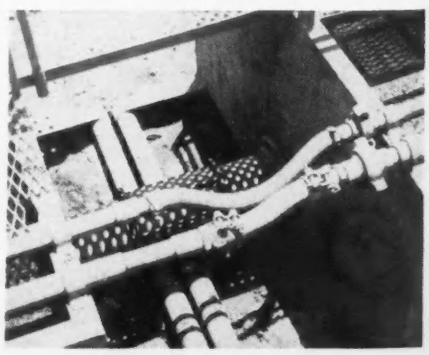
Advantages made available by the installation include adequate protection of the blowout preventer pump and convenient operation of the control panel. Removal of this equipment from the rig floor offers a desirable safety factor since the unit can be operated from ground level in case of a potential blowout. The rig transport problem is minimized by incorporating the pump and control panel with the tool house.

HOW TO—Minimize Line Vibration

Vibration in lines anchored atop mud tanks can be eliminated by fastening high pressure rubber hose junctions between tanks and at the mud and water pump connections feeding fluid through the lines. The policy of strapping mud and water lines to mud tanks permits greater rig portability plus a more flexible gunning and water supply system; however, since the source of these mud and water lines is a supply pump, the transmission of vibration is a likely and damaging occurrence. By connecting all components of the system with flexible rubber hose, existing vibration will be absorbed and the danger of damaged fittings and anchoring devices will become non-existent.

One operator has applied this idea in field operation through the installation of high pressure rubber hose fitted and clamped on pipe nipples equipped with a hammer union. The remaining end of the rubber hose is fitted permanently to the iron pipe system since, for rig transport, it is necessary to uncouple only one of the connections.

Another advantage offered by the rubber hose junction lines is that the tanks can be assembled and dismantled with comparative ease.



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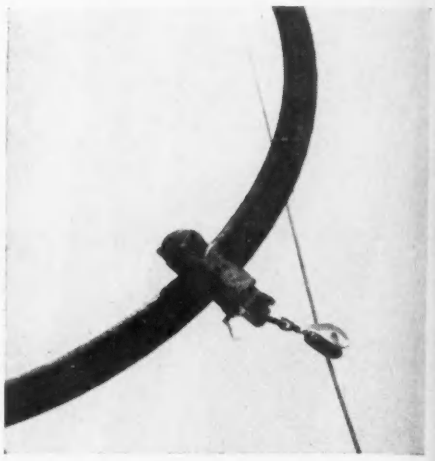
HOW TO— Guide Hose on Jackknife

Movement of the rotary hose on a jackknife derrick can be restricted through the installation of a simple roller device attached to a one-fourth-inch wire guide line. The installation includes clamping one end of the one-fourth-inch line to the finger board of the jackknife while the remaining end is turnbuckled to the outer beam of the floor substructure.

The roller device consists of a light weight snatch block coupled to a 2 x ⅛-inch thick strap iron guide bracket. The strap iron guide bracket is equipped with a three-inch rubber roller, which has been salvaged from a drilling line guide, and a cotter key locked spreader bar immediately above the snatch block.

Designed to travel vertically on the one-fourth-inch line and to roll across the rotary hose, the device allows unlimited maneuvering of the hose during connections or while drilling. Actual field use of the device conclusively indicates a resultant conservation of the rotary hose and the gooseneck and standpipe adapters.



HOW TO— Build Extinguisher Rack

The practice of setting fire extinguishers on the derrick floor, on the ground and atop work benches can be greatly improved by constructing simple racks which are permanently attached at strategic locations around the rig. The placement of this equipment should be well planned and carried out in an orderly manner so that each unit is always in the same locality and has been provided with adequate protection against damage and corrosion.

The illustrated rack is constructed of a 12-inch section of casing featuring a welded cap base and heavy strap iron anchoring lugs. It may be noted that the anchoring lug is welded to the section of the base plate which is preformed with one straight edge. Twin bolt holes are located at either end of the anchoring lug to facilitate permanent fastening to rig components.

The size of the casing employed will depend upon the outside diameter of the extinguisher unit. Casing selected for this purpose should be slightly larger than the extinguisher base so that the unit can be readily removed for service. A door is cut in the side of the rack to conform with protruding mechanism of the extinguisher. Drainage of fluid, which may accumulate in the rack, is provided by holes perforated in the base plate.

The installation is quite inexpensive and will allow decent protection of fire extinguishing equipment. The unit illustrated is attached to the rig stairway, hence, even personnel working on the ground will be near an extinguisher in case of a need for one.

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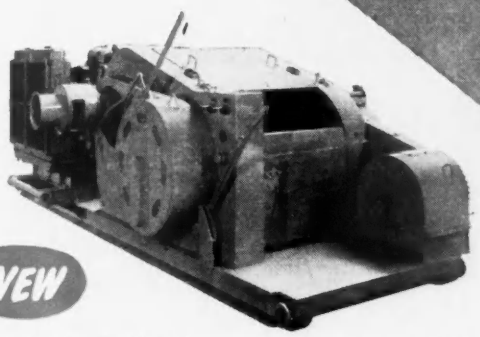

NEW

The *Hydrair* H-35 . . . a torque converter equipped rig for drilling to 5,000 ft. with 4½" drill pipe when powered by an engine developing a total of 350 H.P.

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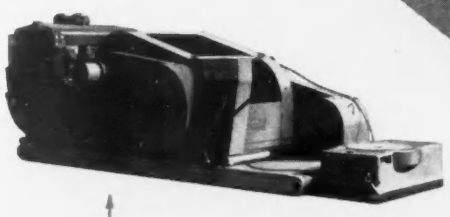
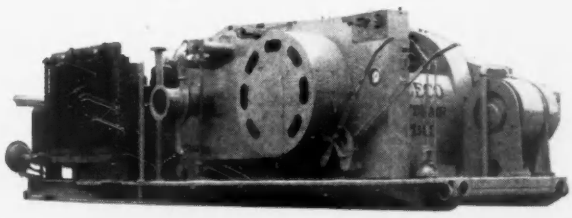
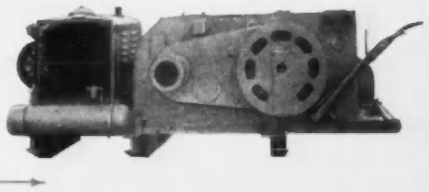


The *Hydrair* H-25 . . . a torque converter equipped rig recommended for drilling to 3,300 ft. with 4½" drill pipe and wire line servicing to 9,000 ft. when powered with an engine developing a total of 200 H.P.



The *Hydrair* H-38 . . . a torque converter equipped rig recommended for workover to 6,000 ft. with 4½" drill pipe and for wire line servicing to 16,000 ft. when powered by an engine developing a total of 400 H.P.

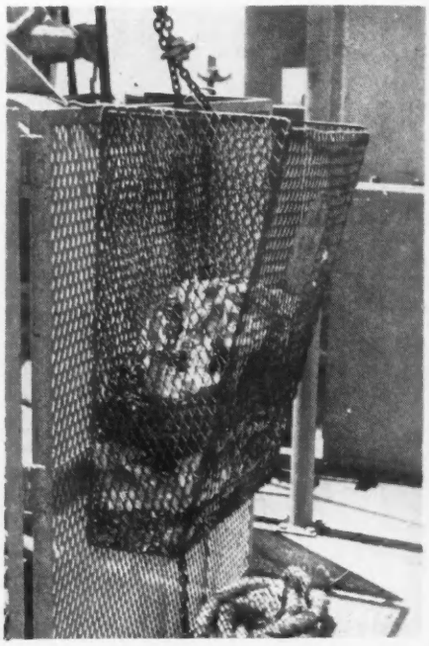
The *Hydrair* H-30 is a torque converter equipped rig recommended for drilling to 4,500 ft. with 4½" drill pipe and wire line servicing to 10,000 ft. when powered with an engine developing a total of 310 H.P.



The *Hydrair* H-20 . . . a torque converter equipped rig recommended for workover to 2,500 ft. with 4½" drill pipe, 4,900 ft. with 3" tubing, and for wire line servicing to 7,500 ft. when equipped with an engine developing a total of 200 H.P.

HOW TO—Fabricate Container for Rag Disposal

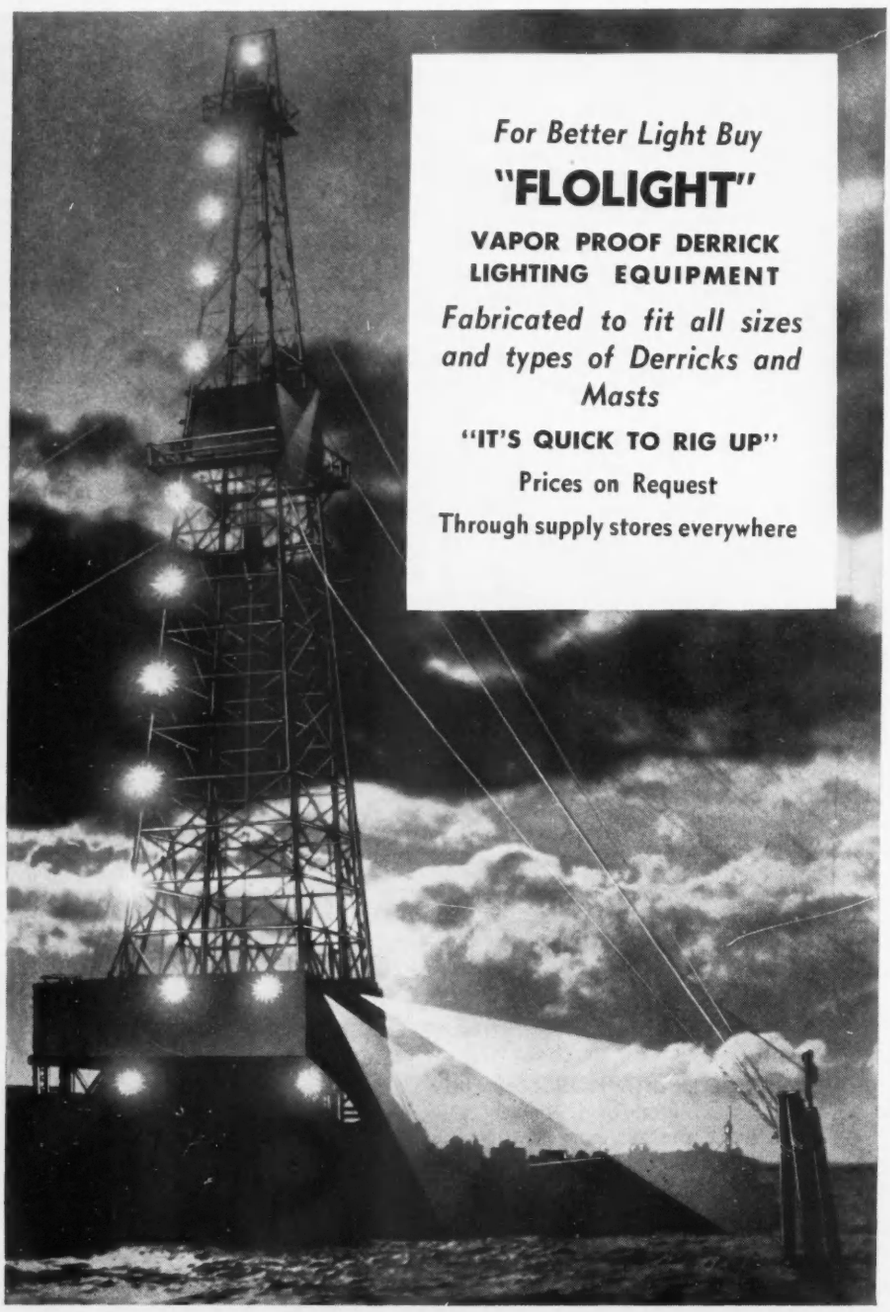
The disposal of oily, gasoline soaked rags can be done with maximum safety and convenience through the installation of an expanded metal basket equipped with anchoring hooks. The practice of placing oily waste and rags in closed containers immediately encourages the development of spontaneous combustion—a serious danger on rigs shrouded with gas in the process of fighting a potential blowout. Although the development of spontaneous combustion is not frequent, every effort should be devoted to the elimination of conditions conducive to this dangerous happening.



Open, well ventilated containers offer the first possible step in establishing conditions which will not encourage the development of spontaneous combustion. One operator has designed a container of a three-eighth inch rod frame covered with expanded metal. Secure anchorage of the expanded metal is assured by spot welding each section to the preformed frame.

An inspection of the illustration will reveal that the front section of the basket is constructed at an angle to prevent the packing of rags in the bottom and to assist in the rapid removal of waste from the unit. Two strap iron hangers are welded to the top segment of the basket to provide a means of suspending the container at convenient spots around the rig. This feature will allow the engine mechanic to attach the basket to a guard rail in the vicinity of the power plant while servicing the engines.

The advantages seen in this inexpensive waste disposal unit include the reduction of fire hazards around the rig and the presence of a sturdy, compact container which may be suspended at nearly any location.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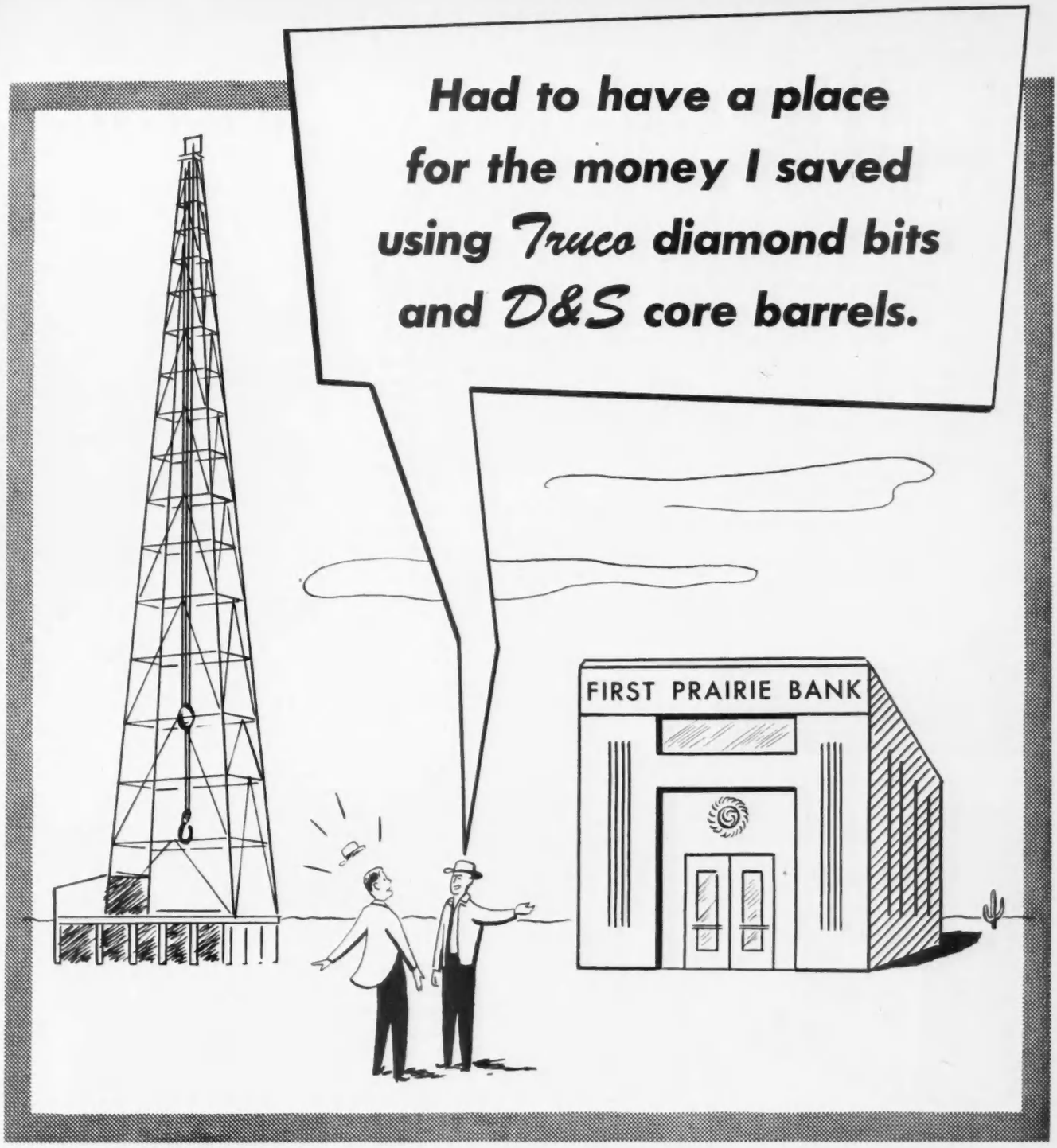

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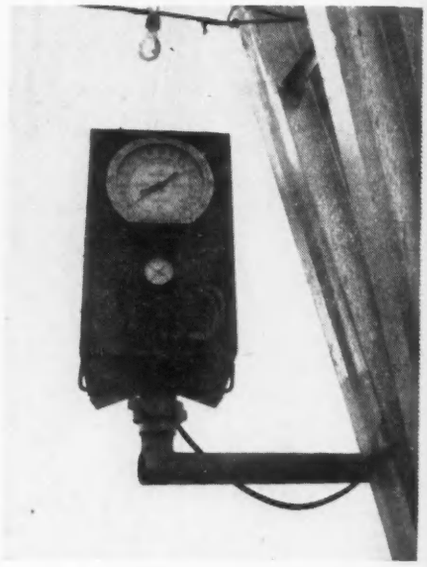
HOW TO—Brace Weight Indicator

Weight indicators can be stationed in an unobstructed area by clamping an extension bracket to the leg of a jackknife derrick. The method involves the selection of a two-inch section of pipe the desired length and the installation of two J-bolts, positioned so that they may be attached to the derrick leg.

The support end of the unit is equipped with a short two-inch nipple welded to the extension. The two-inch nipple attached to the base of the indicator is coupled to the extension by means of a hammer union.

This method removes the weight indicator from the floor where there is always danger of damage from swinging tongs, lines and miscellaneous equipment. At the same time, the indicator is anchored in a position where it is convenient for the driller to observe drill string weight characteristics at all times. An electric light immediately above the indicator dial will increase visibility of the unit after dark.



Prior to a rig move, dismantling the weight indicator simply involves uncoupling the hammer unions and releasing the two J-bolts anchoring the extension to the derrick leg.

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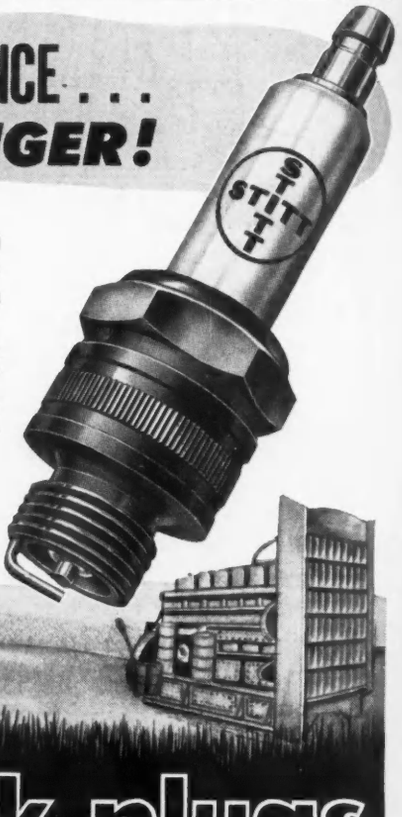

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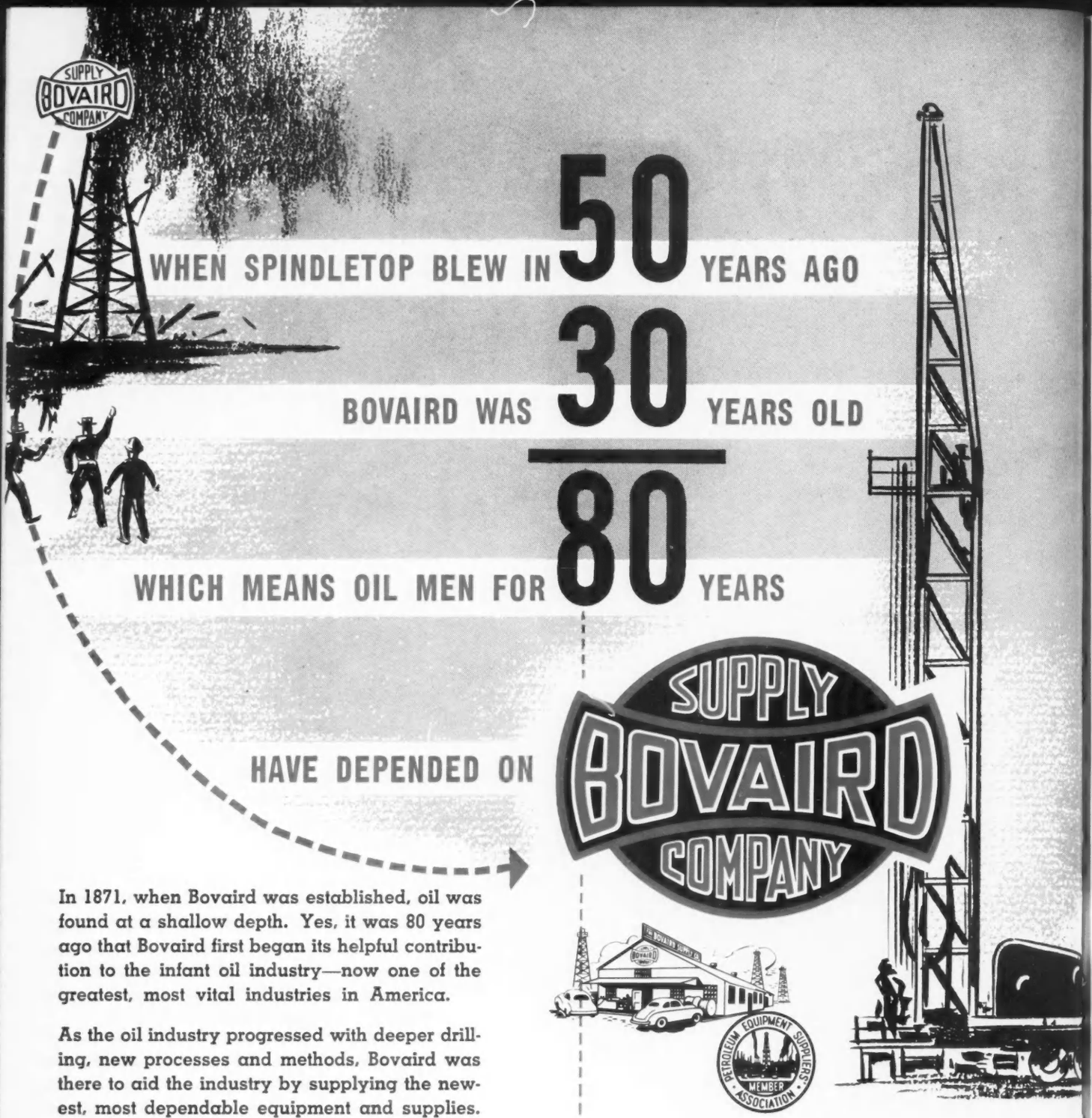

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80 YEARS OF PROGRESS WITH THE OIL INDUSTRY

Pressure Maintenance In BLOCK 31 Field

By RUSSELL C. HARTMAN
The Atlantic Refining Company, Dallas

ABOVE: One of the three high-pressure injection wells in the Block 31 field. This is A well Number 2.

ONE OF the most interesting and successful pressure maintenance projects in the Permian Basin may be found in the Block 31 field. Recognizing early the advantages of maintaining a high reservoir pressure, several operators joined in a project to maintain the reservoir pressures in the Devonian and Ellenberger formations. The author briefly describes the plant and compressor facilities which serve the field. While primarily intended to compress the gas to 4100 pounds per square inch gauge for injecting purposes, the plant incorporates a liquid extraction unit that removes about 1600 gallons per day.

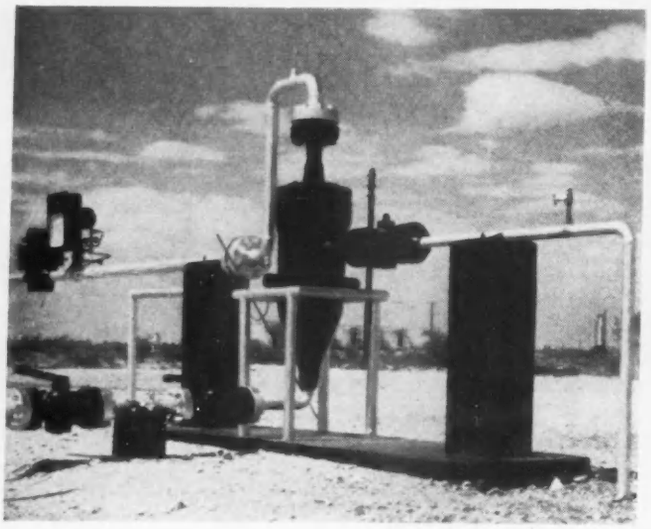
THE pressure maintenance project in the Block 31 field of Crane County, Texas, is a joint venture by The Atlantic Refining Company, Champlin Refining Company, Continental Oil Company and Phillips Petroleum Company, with Atlantic acting as operator of the plant and compressor station. The plant and field are about ten miles northwest of Crane, Texas. The entire project is a conservation measure intended to increase the recovery of oil from the Block 31 field by maintaining a high original reservoir pressure. Gas produced with the oil is processed to strip it of liquid content before injecting it back into key wells.

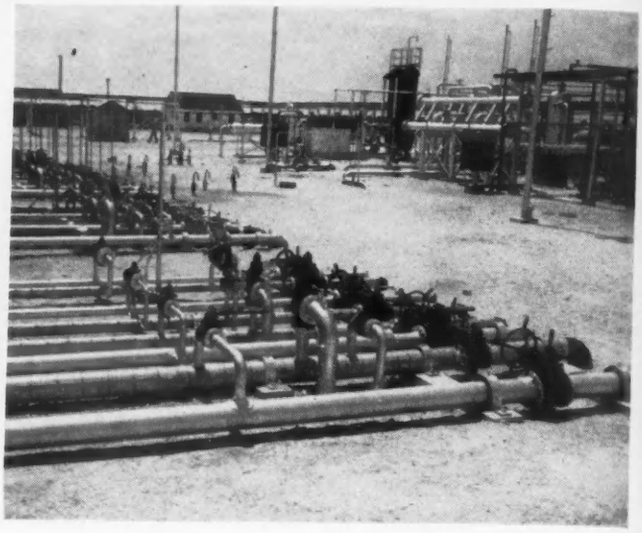
The plant is now receiving gas from 52 Devonian and 16 Ellenberger wells through dual gathering systems operating at seven and 120 pounds per square inch gauge. Sour gas from the two systems is compressed in four and three stages, respectively, to 4100 pounds per square inch gauge and distributed to three injection wells at a daily injection rate of about 9 million cubic feet. A stabilized liquid product of 30 to 40 Reid Vapor Pressure, incidental to compression and cooling of the gas, is recovered at the rate of approximately 16,000 gallons per day.

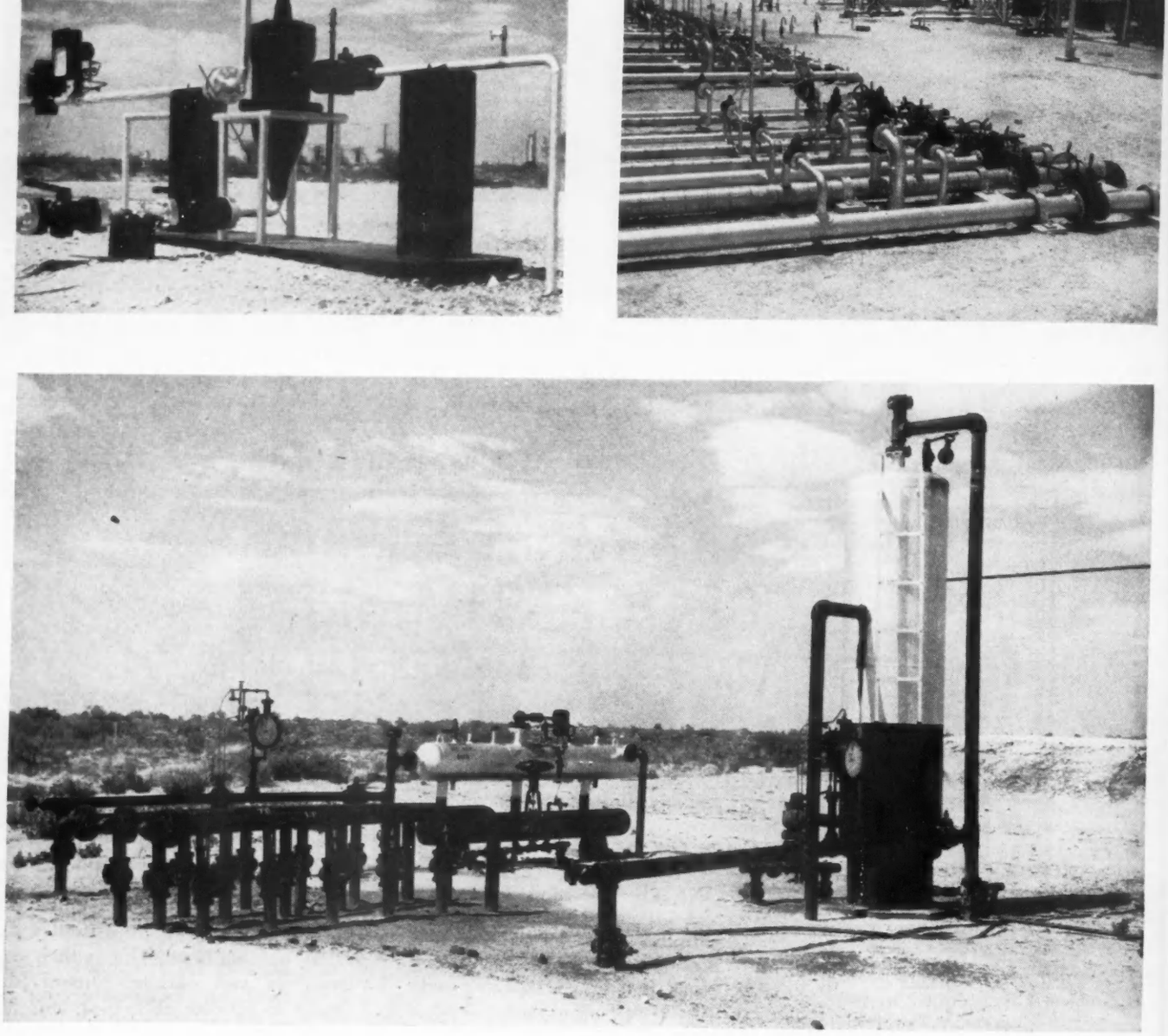
Gas and oil produced from the two main formations, the Devonian and the Ellenberger, are measured separately on each lease. Gas is then collected in two parallel systems, designed to operate at two pounds per square inch gauge and 100 to 200 psig plant inlet pressure. The low-pressure system was extended to all participating leases in the field, whereas the high-pressure system serves the central section of the field where the high-pressure gas is available. Drip tanks are located at low spots in the gathering system for the removal of crude, condensate and water that may remain in the gas.

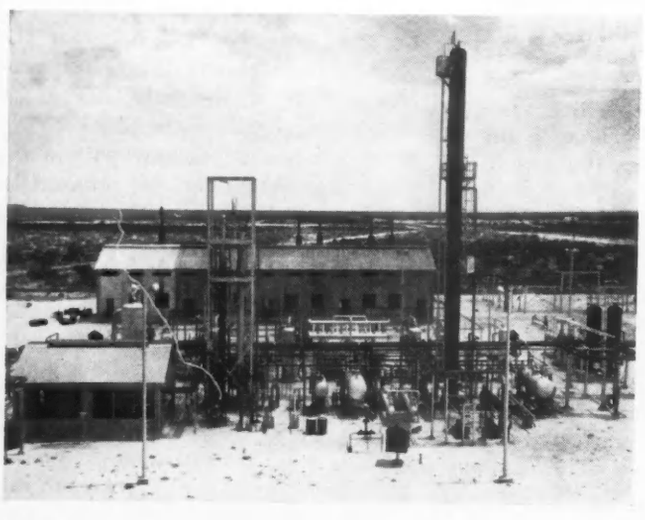
Plant Facilities

The low-pressure gas enters the plant through a large scrubber which is designed to remove entrained liquids. A reciprocating pump operated by level control removes liquids to slop storage. A high-level shutdown









TOP LEFT: Gas enters this high-pressure separator at 4100 pounds per square inch gauge and passes through a standard meter run before flowing into the injection well. Any foreign material removed from the gas stream flows out the bottom of the separator. Flow lines are elevated for convenience of design and installation.

TOP RIGHT: Intake and discharge lines that handle the gas at various pressures to and from the compressor plant.

CENTER: Typical lease hookup for the separation of oil and gas on both high-pressure system and low-pressure system. The high-pressure separator is the horizontal unit at left in the background, and the low-pressure vessel is at right. All gas produced is measured on each lease.

LOWER LEFT: Composite view of the plant facilities taken from the top of one of the two 3000-barrel spherical storage tanks. Extraction facilities are shown in the foreground, with the compressor plant in the background.

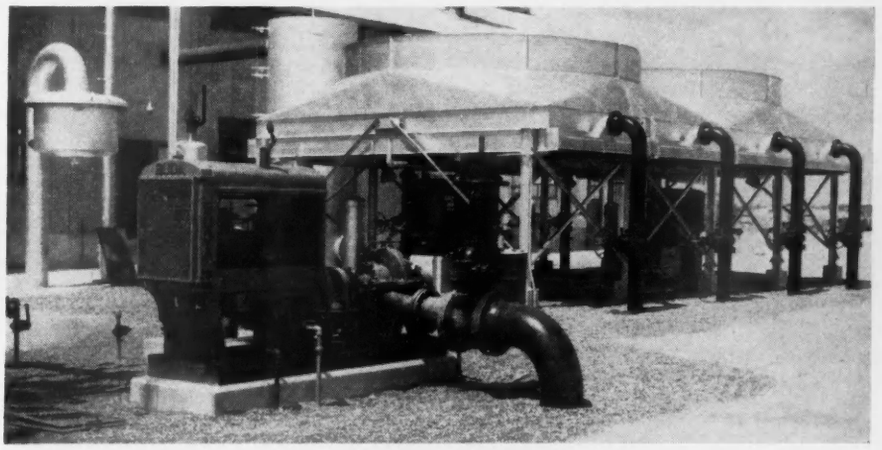
device connected to the low-pressure compressor ignition systems prevents damage to the equipment from liquid carryover. Another safety device shuts down the low-pressure equipment if the plant inlet pressure drops below 0.5 psig. This prevents entrance of air into the plant gas stream. Gas which enters the first stage at about seven psig is in turn compressed and cooled in three stages at discharge pressures of about 60, 275, and 1200 psig, respectively. The low-pressure and high-pressure gas streams are comingled at the 1200 psig stage and compressed to 4100 psig for injection use. One 880- and two 800-horsepower compressors are used in low-pressure gas compression service.

The high-pressure gas enters the plant through a scrubber which removes crude, condensate, and water under liquid level control and transfers it to slop oil tankage. As in the case of the low-pressure inlet scrubber, dangerously high liquid levels shut down the 800-hp high-pressure compressor. The high-pressure gas is compressed from about 120 psig in two stages to 400 and 1200 psig, respectively. As previously mentioned, the combined high and low-pressure gas streams are then compressed to 4100 psig for injection.

Although a small amount of condensate is knocked out of the low-pressure gas stream in the second stage discharge separator, a high percentage of the liquid is separated in the 1200 psig separator at about 100° F. and flows to the stabilizer via a feed surge tank for removal of propane and lighter ends. The stabilizer is a 30-tray tower with alternate feed tray inlets at the 10th, 14th, and 18th trays as numbered from the bottom of the tower. The tower is supplied with a "puking" type reboiler using 175 psig steam. Refluxing is accomplished in a conventional manner. The hot stabilized gasoline is exchanged with tower feed, water cooled, and run to two 3000-barrel spherical storage tanks. The gasoline is then either pumped to a crude pipe line outlet or to a truck loading rack located adjacent to the highway, but on the plant site.

A portion of the sour tail gas from the stabilizer is burned under the two 150-hp oil field type boilers. The remaining sour tail gas is combined with the necessary amount of high-pressure field gas and sweetened for other plant and lease fuel gas requirements.

Fuel gas is sweetened in a packed column employing countercurrent flow of gas and 20 weight percent diethanolamine solution at an operating pressure of about 110 psig and a temperature of 100° F. The hydrogen sulfide gas is removed in a packed column stripper at a pressure of ten psig and a bottom temperature of about 235° F. The hydrogen sulfide gas is then burned in the plant flare. Both the diethanolamine stripper reboiler and the hydrogen sulfide cooler are tubed with stainless steel to reduce corrosion.



Recently-installed air coolers and pump adjacent to the compressor house. This equipment cools the compressor and power cylinders of three 800-horsepower units and one 880-horsepower unit.

All cooling in the plant is done by shell and tube exchangers supplied with cool water from one induced draft cooling tower with the exception of the engine and compressor jacket water systems which are serviced by two gas engine-driven air coolers. Design of the air-cooled system provides for a ten-degree rise in water temperature through the jacket water system to 160° F.

Steam condensate is used as make-up liquid for the closed jacket water system. Treated water is supplied to the boiler, and raw water and required chemical treatment are supplied to the circulating cooling tower water system. Plant water is supplied from a field water system and a 1000-barrel tank is provided in the plant as well as a 10,000-barrel tank in the field for reserve supply in case of water source failure. Plant waste water flows to a large evaporating pit located outside of the plant site.

All of the centrifugal pumps, with the exception of a jacket water pump, are electrically driven and have steam turbine driven spares. The induced draft cooling tower fan is electrically driven; the air cooler fans are gas-engine driven. Power is purchased at 2300 volts and is stepped down to 440 or 110 volts for plant use and lighting; daily power consumption runs about 3000 kilowatt hours. In the event of power failure, the three most vital steam turbines are started automatically. These pumps are on boiler water feed, cooling tower circulating water, and compressor jacket water circulating services. Additionally, a steam-driven 110-volt generator is automatically started to provide for lighting power.

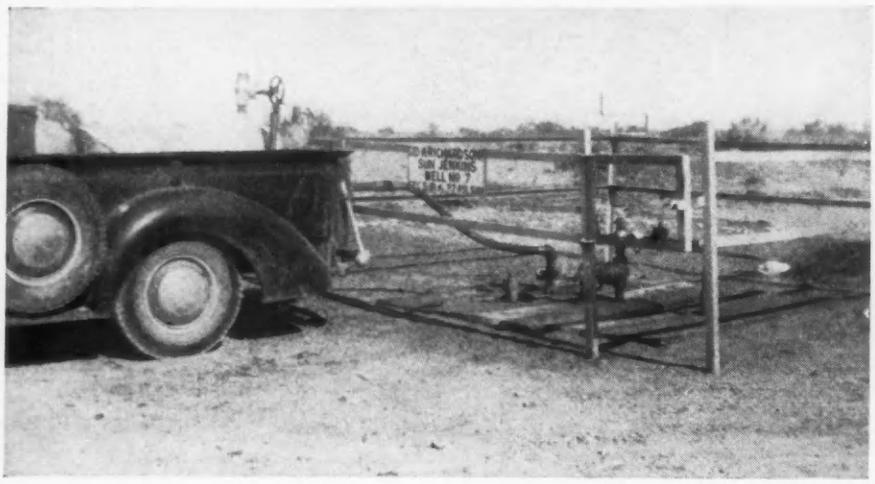
The injection gas is dehydrated at the 1200 psig stage after separation of free water and hydrocarbons in a standard dry type package unit.

Injection System

The hot dehydrated injection gas leaves the plant through a master meter and is distributed to three injection wells. Each of the wells is provided with a separator to remove any heavy lube oil or solids washed from the lines. The gas then is metered through specification meter runs by means of flow and temperature recorders. Quantities of gas can be proportioned to each well by means of adjustable chokes.

About the Author

RUSSELL C. HARTMAN began work for The Atlantic Refining Company in 1936 in the Research and Development department after graduating from Pennsylvania State College with a B.S. degree in chemical engineering. He served in various capacities in laboratory development, pilot plant and refinery technical service projects in Philadelphia until his transfer in 1944 to the Domestic Crude Production department at Dallas. He has held successive positions in the Natural Gas Section as engineering assistant and senior engineer, and at present is the assistant natural gas superintendent of this section. Hartman is a registered professional engineer.



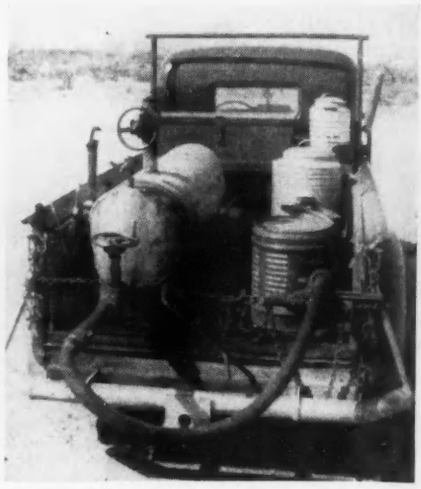


FIGURE 1 (left). A single connection with no special fittings enables the operator to lubricate fresh water into the casing. Equalizing line is not used unless it is desired to lubricate water into the well at a rapid rate. Fresh water dissolves encrusted salt that interferes with operation of flow valves.

FIGURE 2 (right). One-barrel capacity tank made from 20-inch casing, with connections, for lubricating fresh water into casing annulus under pressure. Valve on top of tank permits connecting equalizing line when needed The tank may be removed easily from the truck so that the vehicle can be used for other purposes.

Keystone Field Operating Problems

By WALTER D. POWERS

Richardson & Bass, Kermit, Texas

PRACTICAL and efficient field procedures to combat some of the severe production problems in the Keystone field of Winkler County, Texas, are described. The techniques discussed grew out of mounting problems that threatened to lower production rates of individual wells in the field.

A CONSIDERABLE portion of total operating costs in the Keystone field of Winkler County, Texas, may be classified generally as cost of prevention and removal of unwanted residues. These residues include sand, salt, paraffin, and scale. In the cases where dry gas is needed, oil and water in the gas transmission line become unwanted residues. Since there are six producing horizons in the Keystone field, methods of removing unwanted residues are perhaps more varied than those usually encountered elsewhere. Some of the time- and cost-saving methods devised for overcoming these problems are largely responsible for the reduction in operating costs.

Sand Removal

In the 3400-foot Colby section, accumulations of fine grained sand in the well bore is a problem similar to that encountered in many fields. Wells were shot heavily on initial completion, and are now approaching the latter stages of primary production. Most of these wells are on artificial lift, either gas lift or pump. Gravity of the oil is 34 to 36 degrees API. The wells produce very little water, rarely more than 2 percent.

The sand generally is allowed to accumulate until it reduces productivity to a point approaching the economic limit. During this period of accumulation, successive pulling jobs will result in higher pump or gas lift settings. As a general rule, when sand fills the bore to the top of the pay, the well will not produce enough oil to warrant continued operation, and cleanout work must be undertaken. The usual means employed are by cable tools and sand pumps. Although these small cable tool units operate cheaply when considered on a per-hour basis, the number of hours required to clean out one of these caving wells brings to mind the disheartening analogy of moving a Winkler County sand dune with a teaspoon.

Reverse circulation has been tried as a means of cleaning out these wells, but an excessive amount of oil used as a circulating medium is lost to the low pressure formation. Furthermore, the column of fluid seems to prevent the well from caving as it would normally with low operating fluid levels. After the reverse circulation cleanout is ended and the fluid column is removed, caving re-occurs.

One of the more novel means of cleaning out sand involves the use of high-pressure gas with a production string of two-inch tubing. The usual gas lift installation was made, but the packer was not set. The perforations were made lower in the sand, and gas was applied to the casing, under a pressure of 580 pounds per square inch. Some material was removed from the well in the form of oily mud. The gas volume was held to that used for normal production. Although the cleanout could not be termed success-

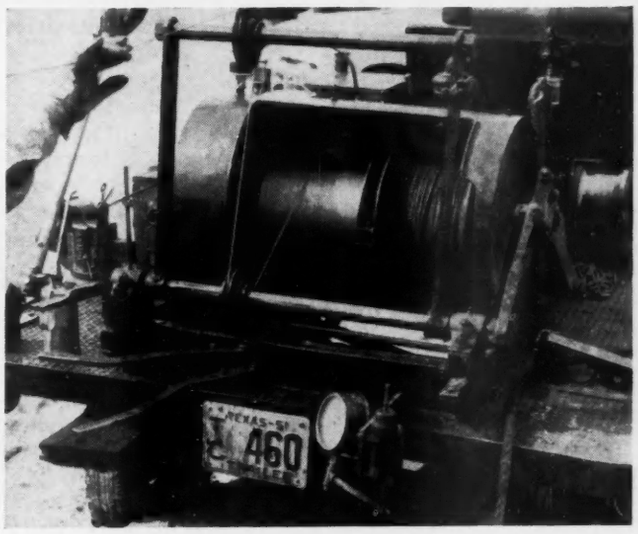


FIGURE 3 (left). Compact arrangement of four-cylinder engine, spudding unit, and tool boxes permit use of small tandem trailer to transport the complete paraffin scraping unit.

FIGURE 4 (right). Spudder arm motion is taken off at the drum shaft on this paraffin scraping unit. Pressure gauge and master brake cylinder are used as weight indicator when linked to spudder arm directly above master cylinder. Cathead is used for rigging up lubricator and tools.

ful, this attempt may be the forerunner of a means of removing sand rapidly, especially in view of the fact that drilling with compressed air as a circulating fluid has proved successful.

Salt-Encrusted Flow Valves

The 3400-foot pay zone also is subject to accumulations of salt in the well bore. Strangely, the salt will accumulate in the casing above the packer and interfere with the action of flow valves. No reason is advanced for the accumulation of salt in the casing above a packer, although it may come from seeps in the casing. Wells troubled with this salt accumulation do not necessarily produce water, and no similar difficulty arises in wells completed in lower horizons where production is lifted with the same gas, indicating that the salt is not associated in any manner with the input gas.

Since the problem is easily handled, a thorough analysis of the causes of the salt accumulation has not been made. Figure 1 shows the equipment used for lubricating fresh water into the casing annulus of gas lift wells to dissolve the salt. A section of 20-inch casing, mounted and holding a volume of one barrel, is filled with fresh water. The tank is connected to the well with two-inch connections. The unit is carried in a light pickup truck. An equalizing line can be connected from a point above the fluid in the tank to the well, but the water gravitates into the well at a satisfactory rate without the equalizing line and it is rarely used.

Water is allowed to stand for two to four hours, which is sufficient time to dissolve the salt. Then it is removed up through the tubing by kicking with gas. As a general rule, this process is repeated every two or three weeks. However, the real indication of need for desalting is the sudden inability of a flow valve to shut off. As the fresh water treatment generally results in a return of satisfactory valve operation, many pulling jobs are saved by this salt dissolving method. A small, high-pressure pump and a tank might also be used for this work but, since the water is available from many points on the field fresh water system, the advantage of the pump and tank is minimized, and the equipment investment (Figure 2) is greatly reduced by the lubrication method. By lubricating a limited volume (one or two barrels) into the wells, the danger of creating a column of water in the tubing that cannot be lifted by these one-valve gas lift installations with available pressure is practically nonexistent.

In another application of the fresh water washing technique, the perforated intervals in the casing of 8500-foot Silurian wells in the field have been washed with fresh water to remove encrusted salt, with very beneficial results. Productivity increases of from 20 to 50 barrels of oil per day have been achieved. These wells produce from a dolomite formation, have low fluid levels, and they are produced by hydraulic pumps. This application of fresh water is relatively recent, and additional experience must be gained before this treatment can be used to best advantage.

Paraffin Removal Techniques

Paraffin accumulates most rapidly in Devonian wells in the Keystone field. These wells are completed at 7500 to 8500 feet, and paraffin may form to a maximum depth of 5000 feet. Ordinarily the paraffin maximum depth is 1500 feet and generally is very serious to a depth of 900 feet. Paraffin forms quite rapidly in these wells. After 24 hours of production, a swab frequently will not go down the tubing. Removal of this residue is necessary at intervals of about four days. Paraffin accumulation is much less serious in wells completed in other formations.

Paraffin removal is accomplished by using scraping equipment and soluble plugs. The trailer-mounted paraffin scraping hoisting and spudding equipment shown in Figure 3 is essentially a miniature drawworks with a spudding attachment, chain-driven by a small four-cylinder engine. The cathead is mounted on the jackshaft, and spudding action is developed by rotation of the drum shaft. The pressure gauge noticeable in Figure 4 is part of a simple weight indicator. When weight information is needed, the indicator linkage is bolted to the spudder arm immediately above. As tension is applied to the line, the relative amount of force is transmitted to the supporting spudding sheave, through the linkage, to a master brake cylinder taken from a truck, where the proportional pressure develops.

It will be noted that two lines are carried on the drum, separated by a divider. The 9/64-inch woven "shooter's line" is used for paraffin scraping, and the .082-inch line (steel wire) is used for handling subsurface chokes and making well measurements. Figure 5 shows the light ladder-equipped mast which is clamped to the well

head. A cathead-operated rope is used to handle the equipment.

The paraffin scraping tool shown in Figure 6 was designed and made by the men who operate the scraping equipment. Essentially, it consists of a piece of five-eighth-inch sucker rod, turned down to permit entry into one half-inch pipe. Two pieces of one half-inch pipe are used, upon each of which is welded a steel spiral. The spirals oppose each other in direction of rotation. These spirals are actuated relative to the sucker rod section by pins welded to the rod and which slide through grooves in the spiral sleeves. The groove is cut in the one half-inch pipe on a spiral reversed in direction to that of the steel scraping spiral welded to that particular one half-inch pipe section. A spinning and drilling action is obtained on some part of the paraffin knife as long as there is paraffin present to interfere with the free travel of the knife. The equipment is moved with a jeep, as four-wheel drive is desirable at sandy locations.

Soluble plugs have minimized the amount of mechanical scraping necessary. Wherever a source of gas pressure in excess of tubing pressure exists, these plugs are useful. The plug is placed in the top of the tubing and gas pressure applied above the plug. It is doubtful that the plug retains its original dimensions for many feet of travel, but by this time the paraffin has formed a plug, and scraping continues. In this sand dune area, there is no reason for trying to trap the plugs or to accumulate the paraffin taken from a line, so the plug and the scraped paraffin are simply blown from the tubing.

Scale Removal

Formation of scale in heater treaters and occasionally in lines has been serious in a few instances. Chipping and scraping this residue from metallic surfaces is time-consuming, and every effort is being made to avoid this procedure. Inhibited hydrochloric acid has been used with some degree of success. However, tests now under way may lead to scale elimination by use of anodes. Two types of anodic protection are on test. The usual magnesium anodes have been installed in a few scale collecting treaters. The other type is a thermopile direct current generator, installed to combat the most severe scale-forming conditions available on the lease. An inspection of this installation was made after six weeks of service, during which time 300 milliamperes were generated constantly by the thermopile and supplied to the treater through a carbon anode. So far, it appears that the device is doing the work intended. No adhering scale was found, although a flaky, granular precipitate was noted. Sufficient time has not elapsed for complete evaluation of either type of anode.

Liquid in Gas Lines

The 600 pounds per square inch gas lift system in the Keystone field is fed directly by high-pressure separators, and pressure is balanced by the gasoline plant. Ordinary drips generally have been successful in removing entrained liquids, but occasionally a slug of liquid enters the system as a result of mechanical difficulties with the high-pressure separators. This liquid causes a general disruption of control mechanisms on gas lift wells. Installation of drips of adequate capacity for such situations would not have been practical. On branches of the system where four-inch line was used, the gas was routed through high-pressure separators in the same manner as oil and gas from a well would pass through a high-pressure separator. The separators successfully remove the fluid as it accumulates. A 14-inch line in the field system offered another problem, however, because of its large diameter. In this particular case, a large drip was constructed, and a pressure-operated horizontal high-pressure separator dump valve was installed as an integral part of the drip. Since these installations were made, no further trouble with extraneous fluid has developed.

Conclusion

Removal of unwanted residues offers a large field for further improvements in cost reduction and efficiency of operations. In using equipment and techniques herein described, constant vigilance and regular application are important if production losses are to be minimized. If the past is any indication of the future, it may be expected that many of the practices described will become obsolete in a few years; but until new methods and equipment develop, these practices will serve.

FIGURE 5 (left). Pipe mast with welded ladder is used for handling heavy lubricator and scraping tools. Mast is placed quickly and securely by anchoring open bottom end over a head bolt, and fastening to the well head above by means of a chain and load binder.

FIGURE 6 (right). Close-up of scraping tool. Sinker bar above tool is 1⅛ inch in diameter and 11 feet long.

these Points of Superiority

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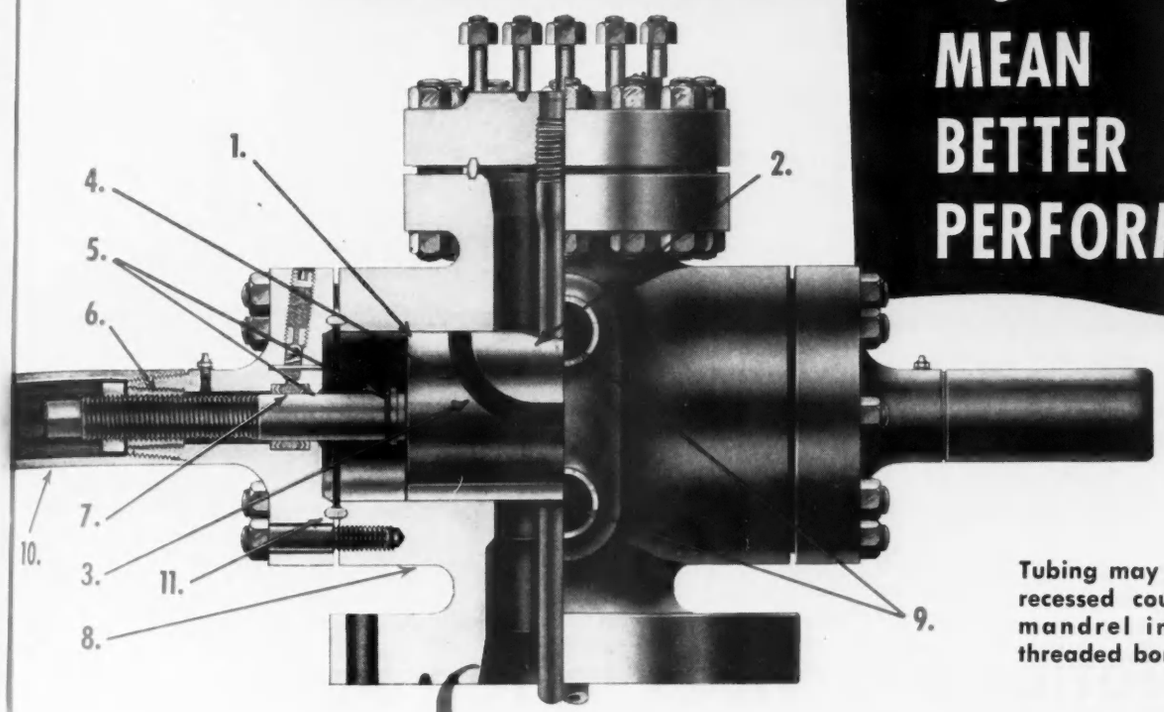

Tubing may be suspended from recessed coupling or threaded mandrel in addition to the threaded bonnet as shown.

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6. THREADED BRONZE BUSHING for ram screw prevents steel-to-steel thread contact . . . assures easy movement of rams even after long standing.
7. PLASTIC PACKING for ram screws, held between "V" retainers, assures pressure-tight seal.
8. STRONGER BODIES with less height are made possible by the round rams.
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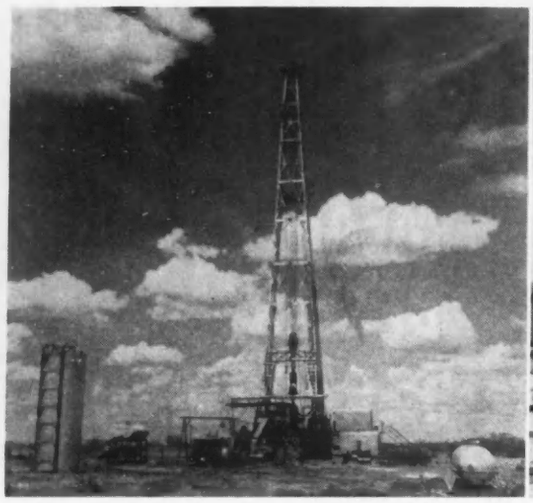
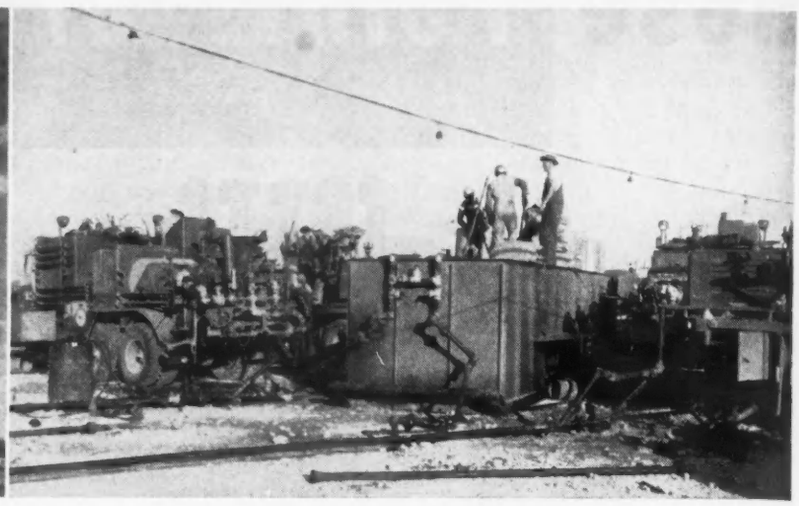




LEFT: Typical jackknife drilling rig used to drill Spraberry wells.

RIGHT: Setting up equipment for formation fracture operations which has proven successful in Spraberry completions.

Completion Practices in the Spraberry

By HARRY E. LEGENDRE

Consulting Engineer, Midland, Texas

LATEST METHODS of drilling-in and completing the difficult Spraberry wells are described. One of the severe problems encountered in this highly active area is that of contaminating the producing formation. This factor alone in many instances will determine whether the well is a pumper or a flowing well, or whether it will produce at all. There has been a variety of completion methods employed, and the author touches upon the most widely-used techniques.

ALTHOUGH little is known of the potential value of the Spraberry sand, development continues at a terrific pace. New operators are moving in, new ideas are being developed, and Spraberry moves on as another chapter in the history of Permian Basin oil production. It appears that this drilling program will bring about many new completion, production and engineering methods. A discussion of the tremendous proportions of this Spraberry play is presented in detail in this issue. To cover the subject as fully as possible it will be discussed in chronological order under several sub-divisions.

Drilling Operations

On Rigs. By far the most popular rig in use is the medium sized jackknife rotary. It is adequate for the job and has the advantage of being easy to move. This rig is generally used to drill to 20 to 50 feet above the sand, being at average depths of 6850 to 7000 feet. The time for moving in, rigging-up, drilling the well and moving off varies from 20 to 35 days, depending on the area in which the well is located, the casing program used, and the amount of lost circulation trouble.

Bits, Drill Pipe and Drill Collars. The bits more commonly used in the area are tri-cone or roller-type rock bits. The average number of bits will vary from 21 to 29.

Most contractors are using 4½-inch drill pipe from top to bottom. In some operations, where large diameter casing is used to greater than average depth, 5 9/16-inch drill pipe is put to good advantage. Some operators are also using 3½-inch drill pipe to drill the lower part of the hole. It is much easier on the rig and saves wear on the equipment, including blocks, drilling line, brake lining and drums.

The number of drill collars used by most contractors is 15 for the upper part of the hole to around 3400 feet. Three drill collars are added to about 5300 feet and then removed. As a general rule 6¾-inch drill collars are used in 8¾-inch hole where 7-inch casing is to be set. For setting 5½-inch casing, a 7 7/8-inch hole is the practice, using 15 and 18 drill collars, size 6¼-inches, as mentioned above.

One contractor is using a two-inch bore instead of a 2¼-inch bore in his drill collars. This arrangement provides more weight on bottom and also gives more stock at the pins. He finds that failures from pins breaking off are fewer.

Mud. There really is no well established mud program. Most wells are

drilled using water and making native mud while drilling through the red bed section. Some operators are mixing 200 to 300 sacks of salt while drilling the salt section to prevent excessive washout of the salt beds between 1700 to 4000 feet. At approximately this depth there is usually a change in formation. If the operator sets an intermediate or "salt string" it will be at depths of 3650 to 4000 feet. He will then clean his pits and drill with clear water or mix a good gel mud cut with crude, weighing from 8.3 to 9.3 pounds per gallon and having a viscosity of 35 to 40 seconds on the average and quite often higher. As drilling progresses to 5300 to 6300 feet, loss of circulation is generally encountered. This is the biggest drilling problem in Spraberry. This condition is usually remedied by various lost circulation materials now available. In a few cases the conditions were so bad as to require cementing off. Most operators report a cost of $2500 to $3000 for mud materials.

Casing Programs. A number of casing programs are being used in the Spraberry trend area and are primarily the result of the current pipe shortage. The following programs are being used, and it may be mentioned that safety factors are not always up to what good practice might dictate.

1. (a) Surface casing: 12¼ to 13⅜-inch set at depths of 125-350 feet. (b) Intermediate casing: 7⅝, 8⅝, or 9⅝-inch is usually cemented in top of the Grayburg lime at 3650 feet to 4000 feet. (c) Oil String: seven-inch or 5½-inch outside diameter liners are run and hung with liner hanging equipment and cemented top and bottom. These liners usually overlap about 125 to 150 feet up into the intermediate casing and are cemented about 30 to 50 feet above the sand as a general rule.

2. (a) Surface casing: 13⅜, 12¼, 10¾, 9⅝ or 8⅝-inch. (b) Oil string: seven-inch outside diameter or 5½-inch from top to bottom without the use of an intermediate or "salt string." This, of necessity, is becoming standard practice as it requires the least tonnage of steel.

3. (a) Surface as in 1 (a) above. (b) Intermediate as in 1 (b) above. (c) Oil string as in 2 (b) above, which is reminiscent of the "good old days."

4. (a) Surface casing of 13⅜, 12¼, 10¾ or 9⅝-inch to approximately 1500 feet or through the red beds. Principally 10¾-inch used. (b) Oil string as in a 2 (b) above.

Cementing Operations. Cementing the surface casing is only routine and will not be discussed further. Cementing of intermediate or "salt string" casing generally is done in one of two ways. Most common is to use enough cement to get a satisfactory job around the shoe. The average job requires 300 to 850 sacks. Quite often, small percentages of gel and filler materials are used to lighten the slurry and get a better "fill." The top of cement on temperature surveys will be found at 2200 to 3000 feet. The other objective is to bring the cement back to the surface and have the casing completely "wrapped in cement" from top to bottom. As a rule this procedure requires from 1600 to 3000 sacks and sometimes more, depending upon the size hole and degree of washouts in the salt section. Various amounts of gel and filler are generally used to lighten the slurry. Usually, 100 or 200 sacks of neat cement is used to have higher strength cement around the shoe and bottom of the pipe.

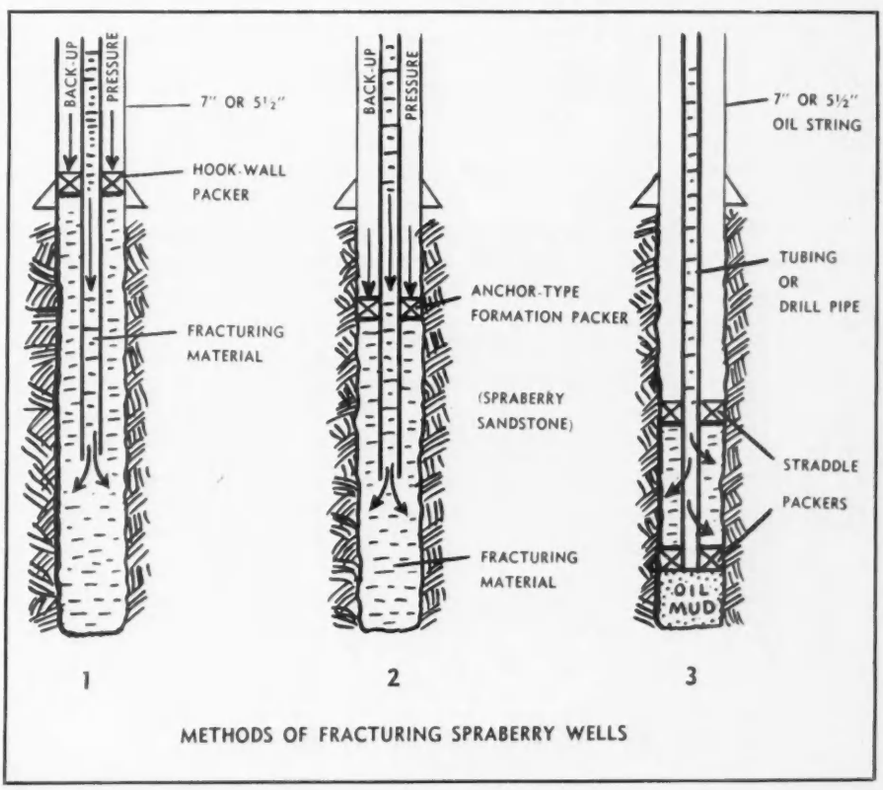
Cementing of the "oil string" will also fall into two categories, as indicated in the casing programs. The same troubles may be experienced in either case, this being loss of cement to the fractured shale and/or sand below the shoe or in the zones above the shoe at 5200 to 6300 feet.

Different methods are being tried to keep the cement from going down into the fractured zones. It is believed by some that careful selection of casing point will eliminate this difficulty. Others believe that the fractures are developed higher in some wells and it is all but impossible to pick a casing point knowingly above the fractured zones. Some operators are taking precautions against this downward loss of cement as it has been found in cores nearly 100 feet below the shoe in some wells. The methods currently being used are as follows:

- A plastic plug consisting of four to six feet of plastic is placed in the bottom of the hole to seal off the open fractures.
- A plug of pea gravel with a cap of super-strength gypsum cement, which is fast-setting has been used with success. This is also intended to seal off the open fractures.
- Mechanical means are also employed in an effort to prevent downward passage of cement. Cementing baskets and formation packer-type cementing shoes are being employed with some success.

The three preventive measures as stated above are being used whether the "oil string" happens to be a "full string" or a liner. The main difference is that in using a liner two cement jobs are required, one around the shoe and a "squeeze" job around the top of the liner.

General. The foregoing was given as a general outline with brief discussion of the usual drilling practice in the Spraberry trend fields. As development progressed, casing has become increasingly more difficult to obtain and it seems that intermediate



METHODS OF FRACTURING SPRABERRY WELLS

casing sizes formerly used in the area are practically extinct. In view of this fact the practice of using only surface and oil string casing developed, and is just about standard practice.

Opinions differ as to whether the drilling contractor is taking undue risks in drilling wells under these conditions. In some cases he is fortunate enough to have protection clauses in his contracts; however, these are exceptions.

On the average, the contract price for drilling Spraberry wells will vary from $5.50 to $6 per foot with variations as to who furnishes fuel and water. The most general price seems to be $5.75 per foot, with the contractor furnishing fuel and water and the operator furnishing mud.

Drilling-In Operations

In the past, the Spraberry sand was considered to be noncommercial and even nonproductive. Even today wells must be handled with the greatest of care to effect satisfactory completions. The well is usually "drilled-in" by cable tools or by reverse circulation with crude oil, using the rig already on location or a lighter workover type rig. Both methods are being followed, with a definite trend being shown toward cable tools. The objective of both methods is to keep mud from contaminating the formation. Both methods have their advantages. Some operators believe that the cable tool operation is more economical and others disagree. Actually, there appears to be little difference in cost, everything being included. The rotary will cost more per day but usually requires less than half the time. By the cable tool method it is possible to get better samples and to check fluid entry into the well bore and get more information as to the productive possibilities of the well.

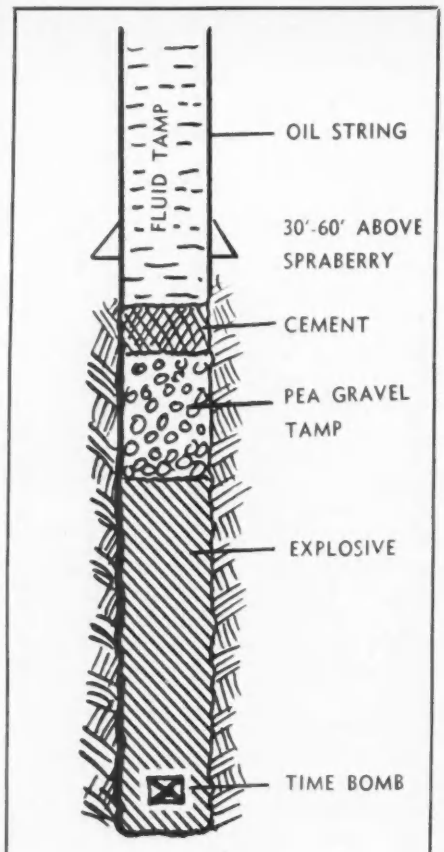
Operators are showing an increasing interest in cores in an effort to learn more about the formation and the reservoir. Diamond coring bits are being used and core recoveries of nearly 100 percent are becoming common practice.

By new methods of core orientation it is now an accepted fact that practically all fractures are in nearly a north and south direction, being slightly east of north and west of south. This has brought up the possibility of increasing production by opening larger numbers of vertical fractures to the well bore. This could be done by directing a hole into the pay section at an angle and could even attain a horizontal direction. It is understood that one operator plans one or more such holes on an experimental basis. Another operator is said to be planning to drill several holes out from the well bore. These are to be horizontal bore holes, probably 1½ inches in diameter, drilled several feet into the formation in east-west directions.

Another good use for the cores is more academic than practical. They are used in an effort to improve core analysis technique so as to more accurately calculate reserves. As it is today, reserve estimating is nearly any man's guess.

A third method of drilling-in is in the experimental stage. This employs compressed air, injected in casing annulus and returning through the drill pipe. One well has been "drilled-in" using this "compressed air reverse circulation" method; however, it was a dry hole, so its merit would be difficult to evaluate.

Despite the generally accepted fact that mud is harmful to the pay, several wells are now being drilled with plans to set casing through the pay and perforate for production. It remains to be seen how successful these will be. Several deep failures have been drilled and plugged back to the Spraberry and completed through perforations. Considerable time and swabbing were required to put the wells on production.

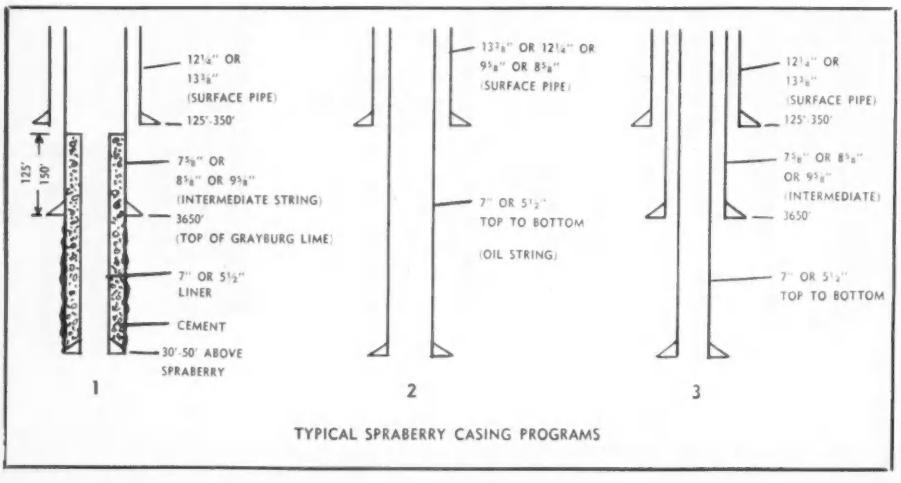


SHOOTING SPRABERRY WELLS

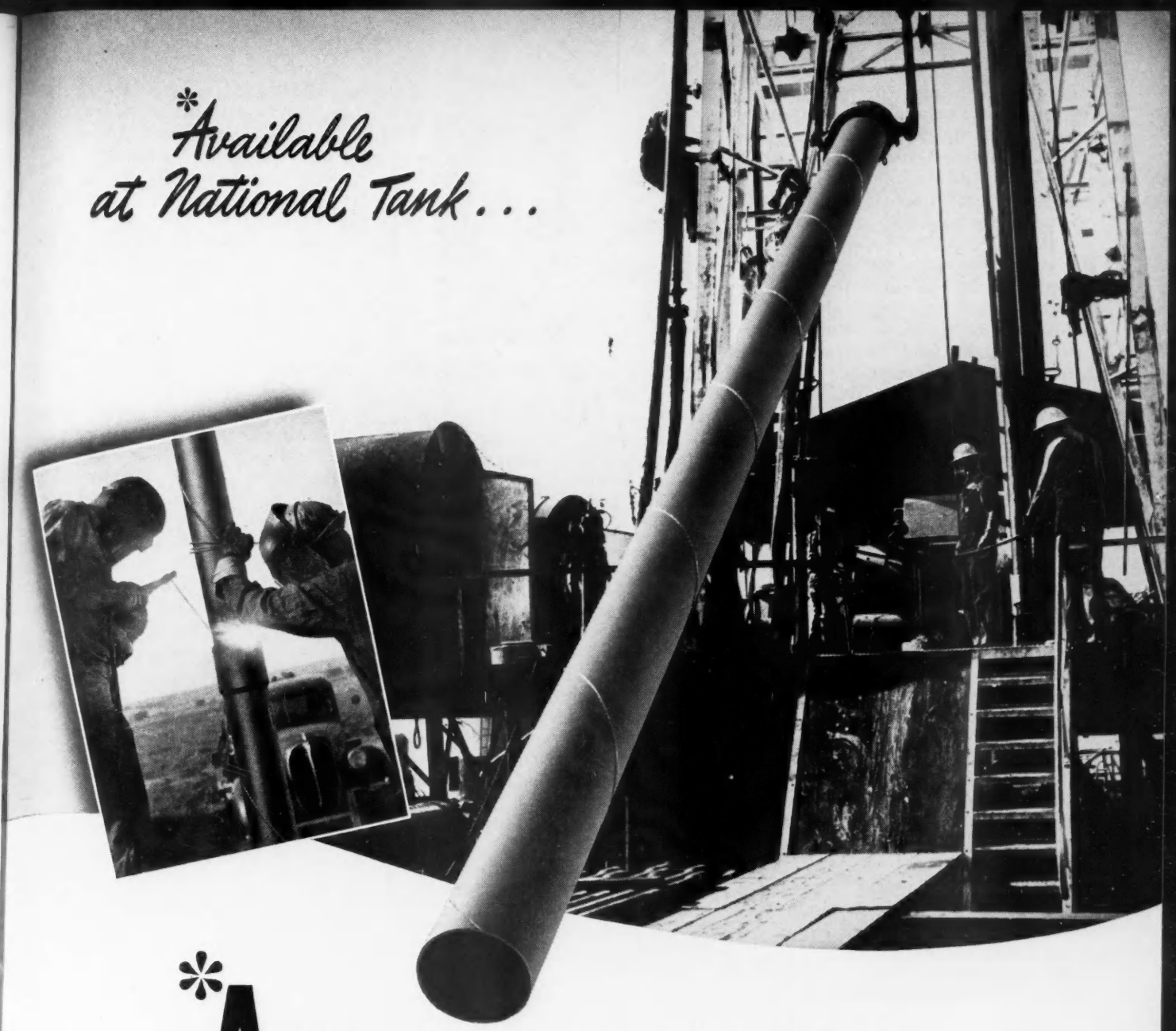
Completion Methods

Several methods are being employed to increase production and induce the wells to flow, as few Spraberry wells have been known to flow naturally. Two methods are most commonly used. The first is by the use of explosives, either nitroglycerin or some of the new type special oil well explosives. The hole is loaded with the explosive opposite the pay section that is to be shot and a time bomb is set to detonate at the desired hour. A tamp of pea gravel is then placed on top of the shot and a plug of fast setting gypsum-type cement is put on top of the gravel. This confines the explosive so that maximum benefits are derived in the pay zone and the utmost in protection is afforded the casing shoe. This method is the least used at this time as it is more costly and more time-consuming. Operators using this method believe it provides more lasting benefit and will more adequately drain the reservoir.

The other method of stimulating flow, is to open the fractures in the



TYPICAL SPRABERRY CASING PROGRAMS



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formation with high pressures and high viscosity gel fluids which are pumped into the fractures. The gel carries with it well sorted sand which remains in the formation to act as a propping agent to hold the fractures open, thereby making them more permeable. The gel is followed by a breaker agent, which within a short period of time will cause the gel to revert to a low viscosity fluid that is produced with the oil. Several methods are being used to place this material into the formation.

After drilling into the desired pay section for 25 to 100 feet, this fracturing material is placed by one of two methods. The first is by the use of a hook-wall packer which is generally run on tubing and set in the casing. The material is placed through the tubing with "offset" or "backup" pressure being held on the casing annulus during the treatment. The other method is by the use of an anchor-type formation packer set at the top of the sand. The type packer found most suitable for this use is one having a long rubber element and telescoping mandrel with pumpout features. This packer has capacity for high differential pressures and easy release. Packers for this type treatment are run on either drill pipe or tubing, (usually 2½-inch EUE), depending on whether it is used on a rotary or cable tool hole. Another variation of this method is to drill 50 to 75 feet into the pay and treat, then drill 50 to 75 feet more and treat the new hole, doing this until either the desired depth is reached or expected production is obtained.

A third method involves drilling into the sand for 150 to 225 feet and using a straddle packer to treat. This packer consists essentially of two packers at a predetermined distance apart and set by hydraulic pressure. They actually "straddle" or isolate the zone to be treated. It may be moved and reset at other zones without removal from the well. In general, three to seven treatments are made in this manner. Usually the packers are set from 20 to 30 feet apart for such treatments.

Some acidizing is being done with special acids designed for the purpose of removing mud, cement, lost circulation material or other foreign matter from the formation. Acid is not being used for completion work as such, but is thought of more in terms of remedial work. The merits of acidizing have not yet been fully established for this purpose.

Several wells have been completed in the upper and lower zones while isolating the middle zone with a liner which was set in place with plastic. The idea was to shutoff the middle zone, as it was believed to be a "thief" section. Later, the liner was gun perforated and the formation treated by fracturing without any evidence of leakage.

Well Costs

The cost of drilling and completing Spraberry wells is another variable factor. On the average, the cost is reported to be $90,000 to $100,000. This figure will vary with the source of the pipe and the casing program as well as the completion method. A number of wells have been reported costing under this figure and several are known to be above it; however, unusual difficulties account for these higher figures.

Well and Lease Equipment

Most wells are equipped with 2-inch EUE tubing and seating nipple so that the well can be placed on the pump without pulling tubing. In addition, hook-wall packers are commonly used. Very simple christmas trees are installed and are of the type usually assembled in the field. Material used in making up the trees are generally 4000-pound test and 2000-pound working pressure.

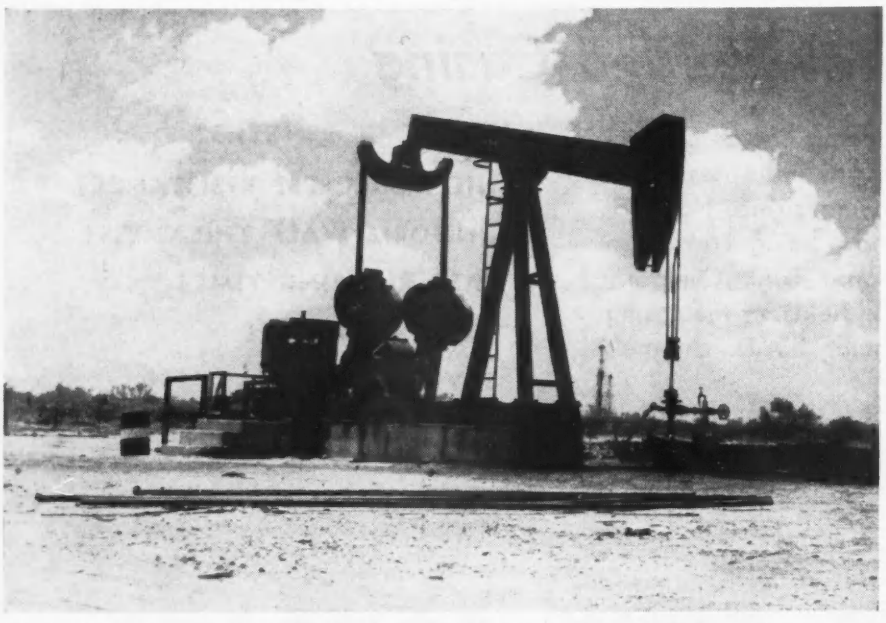
Most tank batteries consist of high 500-barrel tanks, except in the case of the larger leases where 1000-barrel tanks are employed. Nearly all Spraberry wells make small amounts of water at some time or another, and quite often the water is exhausted in a short time. In order to take care of this water production, most leases are equipped with treaters which are capable of handling the produced gas.

More to Learn

While Spraberry production is still new and much is to be learned, the operators are continually striving to find new materials and new methods and the day should not be too far away when operations should be more standardized.

About the Author

HARRY E. LEGENDRE was graduated from Louisiana State University in 1935 with a B.S. degree in petroleum engineering. He has worked with Humble Oil & Refining Company, Union Sulphur and Oil Corporation, and The Ohio Oil Company in various engineering capacities. For the past four years he was West Texas District drilling and production superintendent for Frank and George Frankel. He was active in the development of the Tex-Harvey field. He organized his consulting firm in May, 1951, and has devoted much time to engineering work in connection with the Spraberry fields. He has been affiliated with the API and was one of the organizers of the Permian Basin Section. He was also one of the organizers of the Fullerton Field Engineering Committee. He is a registered petroleum engineer in Texas and New Mexico.



This is the discovery well of the Tex-Harvey field that touched off the boom for Spraberry development. This well is owned by the Tex-Harvey Oil Company.

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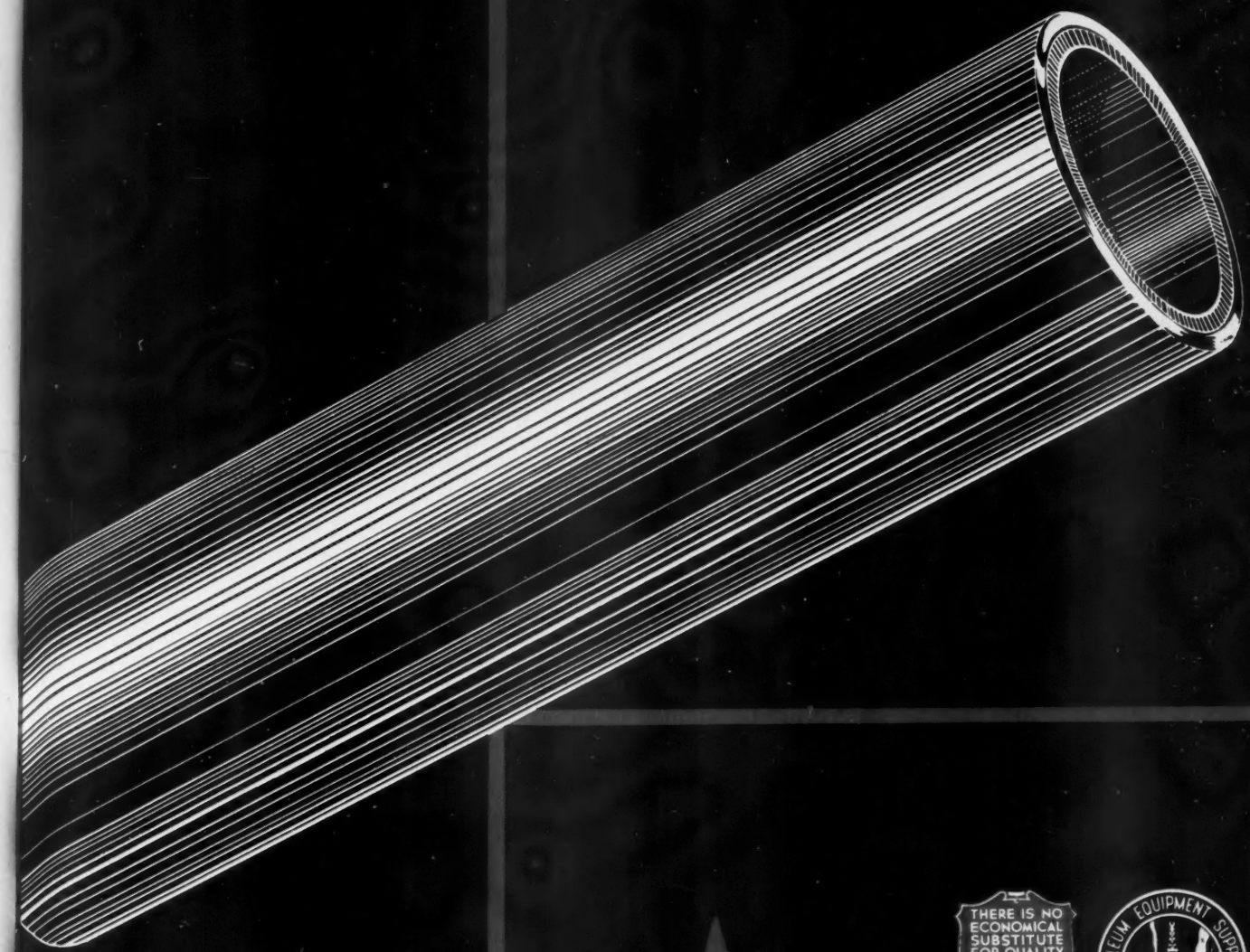

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Developments in the Chemical Treatment Of Wells in the Permian Basin

By R. S. OUSTERHOUT
Dowell Incorporated
Midland, Texas

TWO RECENT and successful developments in the chemical treatment of oil wells are described. While they have found particular application in the limestones of the Permian Basin, both advancements are applicable wherever formations are susceptible to acid. The author discusses some of the disadvantages which have been encountered with normal acid treatments and points out that additives to the acid aid in forming long tentacle-like channels rather than spending the acid strength in the immediate vicinity of the hole. The problem of silicate swelling has also been reduced appreciably in acidizing operations. This development is briefly described.

CONSIDERABLE interest has been exhibited in the last few years toward the increased utilization of acid in treatment of oil and gas wells. Among the significant developments are two improvements that promise to reduce the cost of acid in many cases and bring about better producing conditions. An outstanding development is a channeling acid that does not spend its strength in the immediate vicinity of the hole but dissolves out small tentacles that extend into the reservoir. Another step forward in acidizing techniques has been in the addition of chemicals to the treating fluid to control the swelling of acid insoluble materials present in many formations.

The properties of this new channeling acid are such that the acid dissolves limestone and dolomite to form small channels within the formation. Channel sizes are somewhat varied, but the usual size found in cores has been in the order of ⅛-inch up to ¼-inch in diameter. Almost all the acid is consumed in the reaction necessary to form these channels, with very little of it reacting with the face of the well bore or other parts of the formation.

The process by which this acid reacts with a formation to increase its permeability is different from that of acids normally used in acidizing operations. In the conventional acid treatment, a considerable portion of the acid used is spent reacting on the face of the formation and on sections in the immediate vicinity of the well bore. The acid that does penetrate into the formation tends to dissolve fairly large openings, thus a large portion of the acid is utilized in dissolving the formation which may not be along the oil or gas flow channels.

The mechanism by which channels are formed within the formation depends primarily upon three properties of the solution that are imparted to it by the addition of an organic gel and film forming agents. These properties are: (1) viscosity of the solution (200 to 400 centipoises), (2) ability of the solution to form a film over the surface of the formation, and (3) the inherent tendency of the film in the presence of acid to decompose into a non-viscous solution.

The importance of the viscosity of the solution lies in its ability to make the solution selective, creating channels only in the large pores. Value of the film forming property is that the walls of the pores are coated, thus restricting the dissolving action on the coated surface. This serves to limit the dissolving action of the acid to the relatively uncoated head of the pore. The result of this restricted acid action is the building of long tubular channels into the formation.

After the acid has been forced into the formation, the newly formed channels are lined with the organic film and the small pores connecting to these channels are plugged with the film material. It then becomes necessary to open the channels for drainage by following the channeling acid with 15 percent hydrochloric acid. In the presence of the acid, the organic film is removed and decomposed to a water soluble, non-viscous, and non-film forming material. Most of this acid is spent within the channels since the channels are much more permeable than any other section of the formation.

Utilization of the acid during a treatment, to form these fairly small, uniform holes, increases the efficiency of the acid with respect to its depth of penetration from the well bore, as well as its ability to expose new surface area. During a channeling acid treatment, the same amount of formation is dissolved as in the case of a similar volume of regular acid, but this quantity of formation is removed from a different area.

Core Tests

A comparison of the amount of formation removed from the vicinity of the well bore by 15 percent hydrochloric acid and by the channeling acid is indicated by a study of Figures 1, 2 and 3. The 15 percent hydrochloric acid removed that part of the core sample to a depth of about one-fourth inch, while the channeling acid dissolved material from the surface of the core only to a depth of about 3/64-inch. Further examination of these cores will show the comparative depths of penetration, as well as the amount of new surface area, which the two acids create.

In acidizing these similar cores, three times as much 15 percent hydrochloric acid was required as was channeling acid. The 15 percent hydrochloric acid penetrated 1½ inches into the core while the channeling acid made two channels through the six-inch core. Comparing the amount of new surface which is created, the

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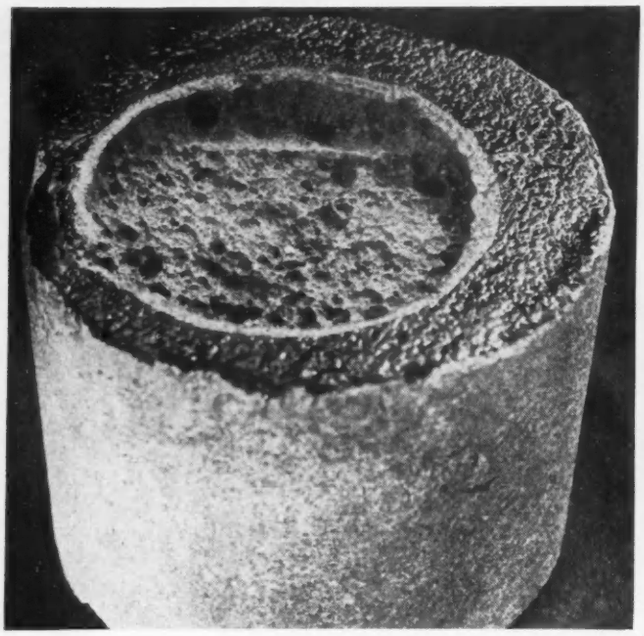

FIGURE 1.
Limestone core treated with 15 percent hydrochloric acid.

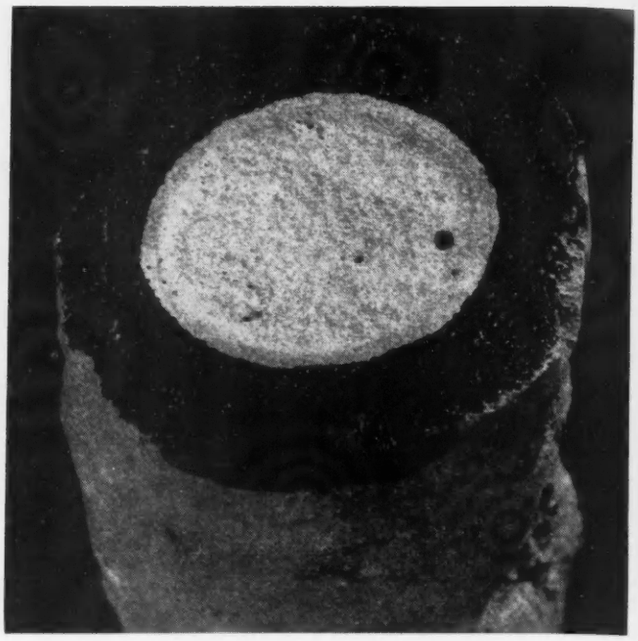

FIGURE 2.
Top of limestone core treated with channel acid.

FIGURE 3.
Bottom of limestone core treated with channel acid to show the depth of penetration of one of the small channels, which in this case extends completely through the core sample.

new acid compound forms two to four times as much new surface area as does an equal volume of 15 percent hydrochloric acid. In doing so it also penetrates 10 to 15 times farther into the formation.

The procedure using this channeling acid is similar to that of a conventional acid treatment. As a general rule, the treating pressures encountered are slightly higher than might be anticipated under usual acidizing procedures. This condition would be expected because of the increasing viscosity above that of hydrochloric acid and because small channels are being formed instead of large holes.

Applications

Although this new acid was designed primarily for the re-treatment of highly-soluble limestone or dolomite zones which retain some bottomhole pressure and continue to have considerable quantities of oil remaining in the formation, it has been used with excellent success in the initial treatment of new wells. When the acid is used on a new well, it has been found advisable to spearhead it with a small volume of 15 percent hydrochloric acid. The regular acid serves to open up the formation, allowing the channeling acid to form a larger number of channels. When it is used to re-treat an old well, the acid is forced directly into the formation without a spearhead of hydrochloric acid. The volumes of both types of acid used to treat a well depend upon the amount of formation involved. Field practice has indicated that the best results can be obtained by using 500 gallons of channeling acid followed by 2500 gallons of conventional acid on new wells and 1000 gallons of channel acid followed by 5000 or 6000 gallons of conventional acid on old wells.

This new acidizing technique is being used extensively throughout the Permian Basin. Its application has yielded consistent success in the Middle and Lower Permian formations as well as the deeper Pennsylvanian and Ellenburger formations. A number of results from various pools in the Permian Basin are tabulated in Table 1.

Several of the results have special significance. The well listed in the Johnson pool was an old well which had declined to ten barrels of oil per day. The well was treated with 4000 gallons of conventional acid with no increase in production. After re-treating this well five days later with 500 gallons of channeling acid and 2000 gallons of conventional acid, the pro-

duction increased to 32 barrels per day initially and was producing 26 barrels per day 30 days later.

Two wells listed in the TXL Tubb Pool are north and south offsets of a well treated with a similar volume of acid, which had a potential of 45 barrels of oil per day on the pump. These two wells potentialed 118 barrels of oil per day and 480 barrels of oil per day flowing. The use of channeling acid in this area has not only increased the productivity of the wells to a greater extent than did conventional acid, but it also decreased the amount of emulsion and sediment, which had previously been encountered after acidization.

The well listed in the Upper Clearfork section of the Goldsmith "5600" was completed similarly to the other offset wells. It was treated with the new acid. Maximum production previously obtained from the lower section by any of the offset wells was three barrels per hour. The Lower section of this well tested 10 barrels per hour after acidizing with 1000 gallons of channeling acid and 5000 gallons of conventional acid.

An illustration of the comparative production decline of a well which had previously been acidized with conventional acid and later reacidized with channeling acid is shown in Figure 4. This decrease in production decline after the new treatment has been particularly noticeable in the re-treatment of old wells.

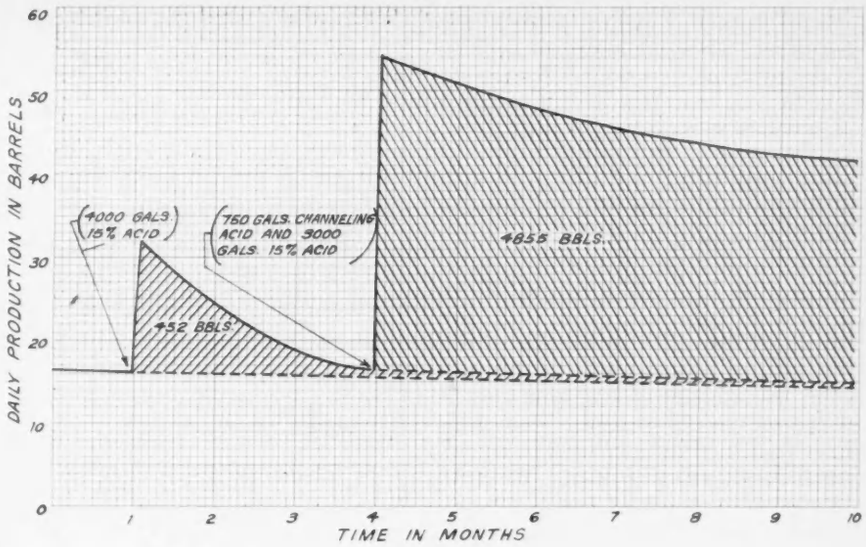
DAILY PRODUCTION IN BARRELS
TIME IN MONTHS
1000 GALS. 15% ACID
752 BBLS.
750 GALS. CHANNELING ACID AND 5000 GALS. 15% ACID
4855 BBLS.

FIGURE 4. Production decline curve of a well in the West Lovington field of New Mexico. The comparison between the normal acid treatment and the channel acid treatment can readily be seen in this case.

Control of Silicate Swelling

It has long been recognized that some of the acid insoluble materials in many formations will swell during an acid treatment. This tends to reduce the maximum benefits which could be derived from acidizing. The insoluble materials seldom will reduce the permeability of an acidized section to that which it was previous to acidizing, but they can reduce the permeability to such an extent as completely to counteract the value of the acid treatment.

Several attempts have been made to change the acidizing solutions to reduce the harmful effects of the insolubles. The only consistently successful change (and it is not very widespread) has been the use of 7.5 percent hydrochloric acid instead of the conventional 15 percent solution. Theory behind the use of this weaker concentration was that there would be a considerable smaller amount of insoluble material in the spent acid solution, which in turn, would result in a more effective removal of the insolubles from the well. The single drawback which has limited the use of the weaker acid concentrations has been that the cost of a given gallonage of weaker hydrochloric acid delivered and serviced into a well is identical to the same gallonage of 15 percent hydrochloric. This practice almost doubled the cost of acidizing services, since twice the volumes of the weaker acid were usually used as compared to the volume of 15 percent acid which was normally considered sufficient.

Laboratory analysis has shown that the acid insoluble materials remaining in a well after acidizing usually consist of varying percentages of silicates, quartz, and anhydrite. Of these three materials, the silicates were found to be extremely harmful. In spent acid solutions, some silicates swell four to five times their original volume. Continued research on the problem of removing the insolubles from a well after acidizing has resulted in the use of a silicate swelling control agent in the acidizing solutions. This control agent, in many instances, effectively reduces the volume of acid insoluble material brought about by acidizing. Reduction in volume of the insolubles serves to reduce the amount of emulsion in the produced oil, to increase the permeability of the formation, and to ease the return of the acid from the formation.

In order to determine the effectiveness of the silicate swelling control agent in acidizing various formations,

TABLE 1
Results of Channeling Acid Treatments in Various Permian Basin Pools

FORMATION	POOL	Before Treatment Production Rate BOPD	Time After Treatment Production Rate Taken	Production Rate BOPD	Remarks
San Andres	W. Lovington	15	5 Mo.	42	Retreatment of old well
Brown Lime	McCamey	6	4½ Mo.	45	Retreatment
Upper Clearfork	Goldsmith "5600"	50	4½ Mo.	210	New Well
Tubbs	TXL Tubbs	24	4 Mo.	160	New Well
Canyon Reef	Diamond M	17	3 Mo.	85	Retreatment
Upper Clearfork	TXL Clearfork	19	3 Mo.	48	Retreatment
Holt	North Cowden Deep	22	3 Mo.	38	Retreatment
Upper Clearfork	Goldsmith "5600"	66	3 Mo.	470	New Well
Paddock	Lea	6	2 Mo.	15	Retreatment
Grayburg	Vaughn	12	2 Mo.	85	New Well
Grayburg	Vaughn	18	2 Mo.	45	Retreatment
Clearfork	Fullerton	7	1 Mo.	200	Well 5 Years Old
Grayburg	Johnson	10	1 Mo.	26	Retreatment
San Andres	C-Bar	23	1 Mo.	46	Well had been previously shot
San Andres	Slaughter	24	1 Mo.	420	New Well
San Andres	South Cowden	20	1 Mo.	115	New Well
Grayburg	Vaughn	5	1 Mo.	50	Retreatment
Tubbs	TXL Tubbs	No Test	2 Weeks	118	New Well
Canyon Reef	Double Mountain	48	1 Week	318	New Well
Canyon Reef	Cogdell	10	1 Week	240	Old Well
San Andres	Levelland	16	1 Week	43	Retreatment
Grayburg	Sharon Ridge	0	1 Week	8	New Well
Clearfork	Goldsmith "5600"	No Test	1 Week	1260	New Well
Canyon Reef	Double Mountain	120	1 Week	748	New Well
Clearfork	Dollarhide	1	1 Week	244	New Well
Clearfork	Goldsmith "5600"	68	1 Week	406	Old Well

several special laboratory tests are necessary. The reduction in swelling is the principal test which determines whether or not the silicate control acid will be recommended in a specific acid treatment. This test indicates the percentage reduction in the swelling which would result if the formation in question were acidized with silicate control acid, rather than conventional 15 percent hydrochloric acid. Field, as well as laboratory tests, have shown (Table 2) that by decreasing the volume of insolubles by 66 percent, the amount of emulsion can be decreased by 80 percent. Field tests have indicated an increased effectiveness in several aspects of the acid treatment (amount of base sediment, ease of spent acid return, production increase) with swelling reductions down to 25 percent.

Field Results

Silicate control acid has been available in West Texas for less than a year. During that time, it has been used in more than 300 acidizing treatments, involving approximately one million gallons of acid. The results have been most encouraging. Its application is versatile in that it gives beneficial results in both new and old wells. In new wells, particularly those drilled in with mud, it has consistently given a shorter cleanup period as well as a better than anticipated productivity. This is undoubtedly due to a two-fold effect of not only reducing the volume of insolubles left from the formation that would have to be returned after the acid treatment, but also reducing the volume of invaded mud that would have to be returned as well. The deswelling effect, which the silicate swelling reducing agent has on invaded mud, can be illustrated by an actual case history of a well in the Goldsmith "5600" field. This well had been completed using 9000 gallons of acid for a potential of 240 barrels per day. To remove the packers, which were used in completing the well, it was necessary to kill the well with mud. The well was put back on production after swabbing for five days. At this time, the well was flowing 32 barrel per day with less than 1 percent base sediment and water. Based upon the reasoning that oil production had been decreased through reduction in permeability by the clay materials in the drilling mud, the well was re-acidized with 10,000 gallons of silicate control acid. This treatment brought the well up to 340 barrels per day, a substantial increase over initial production.

A treatment which indicates the value of the silicate control acid in removing insolubles from the producing flow channels, is that of an Ellenburger wildcat in Upton County, Texas. This well had previously been acidized in two stages. The first stage of 2000 gallons had resulted in a production increase from a mist to two barrels per hour. After re-acidizing with 5000 gallons, the production increased to three barrels per hour. A major part of the acid water from the last treatment never returned. This indicated some blocking or plugging might have taken place from the insolubles which resulted from the acid treatment. The well was then treated with 1000 gallons of silicate control acid and the production increased to eight barrels per hour.

An example of the use of silicate control acid to increase production in areas where conventional acid either failed or produced only mediocre results in that of a Grayburg well in the Jordan Pool. This well had been shot on completion for a potential of 1600 barrels per day. In 12 years, production had declined to seven barrels of oil per day pumping. This well was conventionally treated with 7000 gallons of silicate control acid. Seven days after treatment, this well was flowing 120 barrels of oil per day.

Illustration of the ease of spent acid return is that of a Devonian well in the Dollarhide Pool. This well was acidized with 2000 gallons of silicate control acid. In 90 minutes after treatment, the well had produced back all the acid water and was making less than 1 percent base sediment and water. Prior to using the silicate control acid, the quickest cleanup experienced with the same volume treatment in the same formation had been 13 hours. One of offset wells had taken 36 hours to clean up.

The widespread application of acid treatment to the various oil producing formations in the Permian Basin have brought about these important improvements. They have, in most cases where applicable, increased initial potentials of new wells, increased production of old wells, stabilized the production decline curves on both old and new wells, brought about easier return of spent acid water, resulted in smaller amounts of emulsion, and shortened the time for oil to become of pipe line quality. While these new techniques are supplanting former acid treating methods, investigations continue toward even better understanding of acidizing problems and methods to produce the most desirable results.

TABLE 2
Swelling Characteristics of Various Permian Basin Formations

FORMATION	POOL	Percent Soluble in 15% HCL	Percent Swelling in Spent HCL	Percent Swelling in Spent Silicate Control Acid	Percent Reduction in Swelling
San Andres	Rocker A	66	54	28	48
Grayburg	McElroy	90	18	7	61
Grayburg	McCamey	98	133	20	86
Canyon Reef	Double Mountain	94	50	32	36
Ellenburger	Pegasus	95	50	17	66
San Andres	Levelland	87	47	11	77
Grayburg	Vealmoor	93	29	13	55
Canyon Reef	Diamond M	98	27	17	37
Holt	Emma Cowden	91	32	12	63
San Andres	Slaughter	85	26	13	50
Ellenburger	Brunson	87	43	24	44
Seven Rivers	Grayburg-Jackson	41	11	2	82
Clearfork	Dollarhide	94	46	25	46
Clearfork	East Howard	87	46	22	53
San Andres	Post	67	42	18	57
Strawn	Hulldale	88	50	24	52

About the Author

R. S. (RAY) OUSTERHOUT attended the University of Tulsa from 1939 to 1943 to obtain his B.S. degree in chemistry. He worked in the Dowell Research Laboratory in Tulsa for the following year. In May, 1944, he entered the U. S. Army and spent one year in India and Burma with a Petroleum Testing Unit and Theater Petroleum Staff Section. He was discharged in June, 1946, and returned to Dowell Incorporated as a service engineer at El Reno, Okla. In January, 1948, he was moved to Odessa, Texas, as sales engineer, and in July, 1950, he was made area development engineer. In June, 1951, he was promoted to his present position, district sales engineer.

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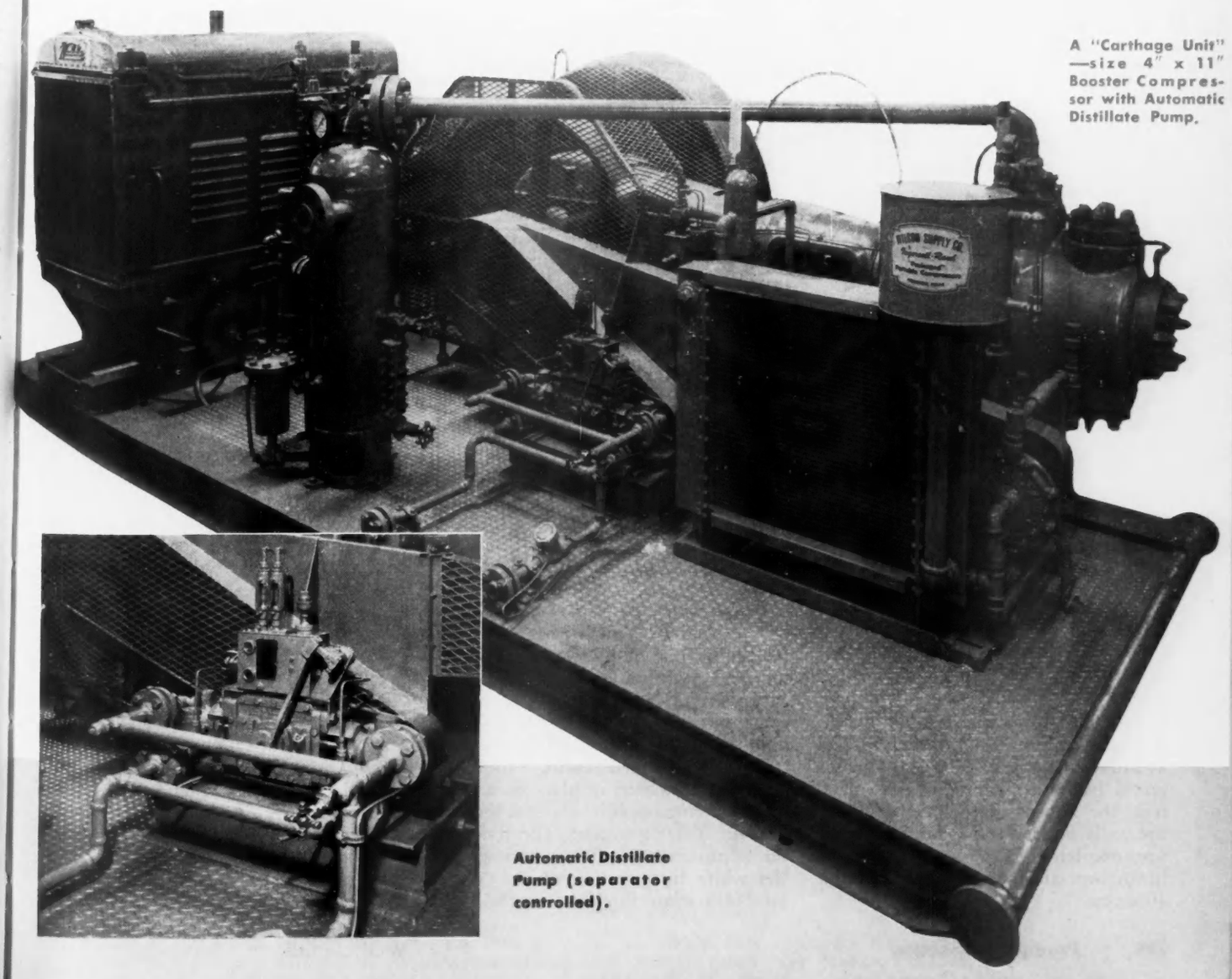


A "Carthage Unit" —size 4" x 11" Booster Compressor with Automatic Distillate Pump.

Automatic Distillate Pump (separator controlled).

By GILBERT M. WILSON
WORLD OIL Staff

Type of drilling rig used by The Pure Oil Company in drilling Clearfork wells in the south end of the Dollarhide field of Andrews County, Texas. The 6900-foot wells are completed in an average of 40 days.

Efficient Techniques Used In Dollarhide Completions

AN UNUSUALLY efficient drilling and completion program involving some of the latest tools and techniques currently is being used by The Pure Oil Company in the development of Clearfork production in the southern end of the Dollarhide field of southwest Andrews County, West Texas.

Included are techniques designed for fast and safe drilling, casing and cementing of the salt zones; use of an open-hole bridge plug which virtually eliminates any possibility of the porous pay zone being plugged off or damaged when the production string is cemented; and use of a corrosion-preventing solution in the tubing-casing annulus above the production packer to prolong the life of those strings.

The Clearfork zone in this area is a highly-fractured limestone topped at around 6100 feet. The 800-foot interval from this point down to 6900 feet, the approximate total depth of the wells, is open to production. Wells are completed flowing, and are drilled in an over-all average time of about 40 days.

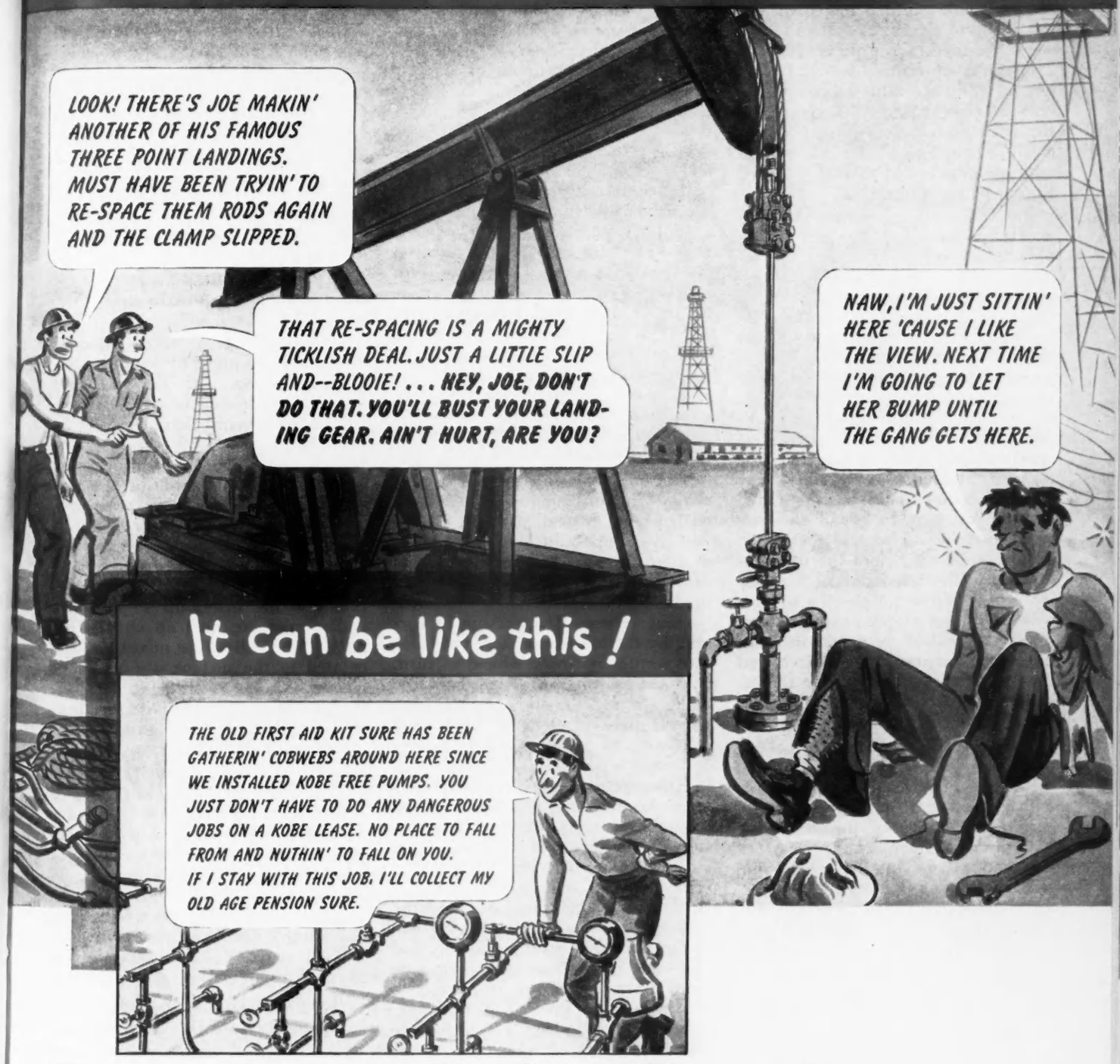
LATEST TOOLS and techniques used by The Pure Oil Company to drill and complete Clearfork wells in the Dollarhide field are described. These new practices not only have reduced normal drilling costs, but simplify and actually minimize future workover operations. The open-hole producing zones in the Clearfork are uncontaminated thereby, assuring maximum recovery when the well is brought in.

A typical Clearfork program calls for the drilling of 15-inch hole to 385 feet and setting a string of 11¾-inch casing as surface string. The string is cemented to the surface. Eleven-inch hole then is drilled to 3050 feet and a string of 8⅝-inch casing, the salt string, is cemented in place as a protection string opposite the salt section and the Yates gas sand. The string is set approximately 100 feet down in the white lime section of the Yates lime formation. Pipe is set in this particular limestone because it provides an ideal, hard formation in which to set the string. It is assured that the hole will be exactly bit size, with no cavities or washed-out intervals that might interfere with obtaining a good cement job.

Salt Saturated Mud Used

A fairly heavy mud of approximately 11.5 pounds per gallon is carried during the drilling of this intermediate portion of the hole. This weight mud is necessary to prevent high-pressure gas in the Yates gas sand, encountered at about 2727 feet, from blowing out. Just before the salt sections are encountered, at a depth of approximately 1320 feet, the mud is fully saturated, at 32 percent by weight, with salt. The quantity of salt used amounts to approximately 400 sacks. If the mud is under-saturated, it will dissolve out salt from the salt zone and cause the washing-out of large cavities which later would necessitate the use of considerably more cement, with resultant higher cost of cementing that string. The value of this use of salt-saturated mud is emphasized by the fact that with

It doesn't have to be this way...


LOOK! THERE'S JOE MAKIN' ANOTHER OF HIS FAMOUS THREE POINT LANDINGS. MUST HAVE BEEN TRYIN' TO RE-SPACE THEM RODS AGAIN AND THE CLAMP SLIPPED.
THAT RE-SPACING IS A MIGHTY TICKLISH DEAL. JUST A LITTLE SLIP AND--BLOOIE! . . . HEY, JOE, DON'T DO THAT. YOU'LL BUST YOUR LANDING GEAR. AIN'T HURT, ARE YOU?
NAW, I'M JUST SITTIN' HERE 'CAUSE I LIKE THE VIEW. NEXT TIME I'M GOING TO LET HER BUMP UNTIL THE GANG GETS HERE.

It can be like this !

THE OLD FIRST AID KIT SURE HAS BEEN GATHERIN' COBWEBS AROUND HERE SINCE WE INSTALLED KOBE FREE PUMPS. YOU JUST DON'T HAVE TO DO ANY DANGEROUS JOBS ON A KOBE LEASE. NO PLACE TO FALL FROM AND NUTHIN' TO FALL ON YOU. IF I STAY WITH THIS JOB, I'LL COLLECT MY OLD AGE PENSION SURE.

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Greater safety is another big plus value you get with Kobe Free Pumping. Workers don't face any of the dozens of accident hazards common to other pumping systems which have exposed moving parts and require heavy tools and equipment to install and maintain.

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the present technique, approximately 900 sacks are required to cement the salt string to the surface. If salt mud were not used, upwards of 2000 to 2500 sacks of cement would be required to do the same job. A 6 percent jel cement is used in cementing the salt string. A caliper survey generally is made of the hole to determine the amount of cement required to cement the string.

The 8⅝-inch salt string program generally consists of 800 feet of 32-pound pipe on bottom, with the remainder being 24-pound pipe. A precaution taken in running this string can save considerable difficulty during subsequent drilling and during the producing life of the well. One joint of the heavier 32-pound pipe is placed at the top of the string. This practice has two advantages: (1) with one joint of the heavier, smaller inside diameter pipe at the top, the driller is assured that the bit or any other tool that might be run in the hole will be sure to go all the way through the lower part of the string, and he knows it before the tool gets down into the heavier pipe; and (2) it is considered better practice to have a heavier joint of pipe at the top as insurance against the likelihood of a blowout occurring at the surface, and the heavier pipe is better for the installation of cellar connections and surface fittings.

From 3050 feet, 7⅞-inch hole is drilled to total depth of around 6900 feet. Fresh water, because of its lower cost and the fact that a regular mud is not needed, is used for circulating fluid down to the top of the Clearfork pay section at around 6100 feet. From that point on, however, a low water-loss mud is maintained to total depth. Normally, a caliper survey is not needed in this section of the hole.

A 5½-inch oil string is set at the top of the Clearfork section. The pay zone, at 6100-6900 feet, is left open. A common practice is to reduce hole size at the top of the pay zone and continue on through it with a smaller bit. Pure has found, however, that it is safer and less expensive to continue on down through the pay zone with the same size bit, then come back up the hole and set an open hole bridge plug at the casing point to prevent contamination of the zone when the production string is cemented. Experience has shown that when the 7⅞-inch bit is continued to total depth, faster hole is made and less trouble is encountered than if the hole were reduced to, say, 4¾-inch size. The smaller size entails substitution of smaller drill collars and it generally does not stay in the hole as long as the larger bit. Also, bearings and construction are heavier on the larger bit and there is less likelihood of a fishing job occurring as a result of bit failure.

Bridge Plug Protects Pay Zone

The open-hole bridge plug previously mentioned plays perhaps one of the most important parts in the successful completion of the Clearfork wells. The plug, of drillable material and one that is run in and set with an electric line, is set in the open hole at the top of the producing interval. Attached to the plug assembly at the time it is lowered in the hole is a dump bailer filled with cement. The load is dumped on top of the plug immediately after the plug is set and as the setting tool and bailer come free to be retrieved.

The open-hole bridge plug used is similar in construction to a casing bridge plug. Instead of being run in with drill pipe and actuated by hydraulic pressure, as is done in some instances, it is run in on an electric line and set by ignition of a controlled burning charge. The pressure generated by the charge actuates the pressure setting assembly which, in turn, transmits a force down through the bailer, setting the slips and packing off the packing element. This force continues to increase until the release stud is pulled in two, disconnecting the setting assembly and bailer from the plug and allowing them to be withdrawn. As the dump bailer is raised from the top of the bridge plug, which now is set in the open hole, the cement (plastic could be used if desired) in the bailer pours out from the bottom and covers the top of the bridge plug. The setting assembly and bailer section then are withdrawn from the hole. Current practice is to use two sacks of cement for this plug. This amount in the 7⅞-inch hole makes a 6½-foot plug above the bridge plug.

Following setting-up of the cement plug, a string of 5½-inch, 15.5-pound casing is run in the hole, the shoe being placed within two to four feet of the top of the cement plug. The string is cemented with 800 sacks of 6-percent jel cement, this quantity being designed to tie in the salt string and extend some 200 feet up inside the 8⅝-inch. A temperature survey is run later to confirm the location of the top of this cement column.

After the 5½-inch production string is cemented, the plug is drilled out with a 4¾-inch bit, the actual drilling requiring only about four hours, after which the remainder of the hole is circulated to bottom. Drill pipe then is pulled and laid down.

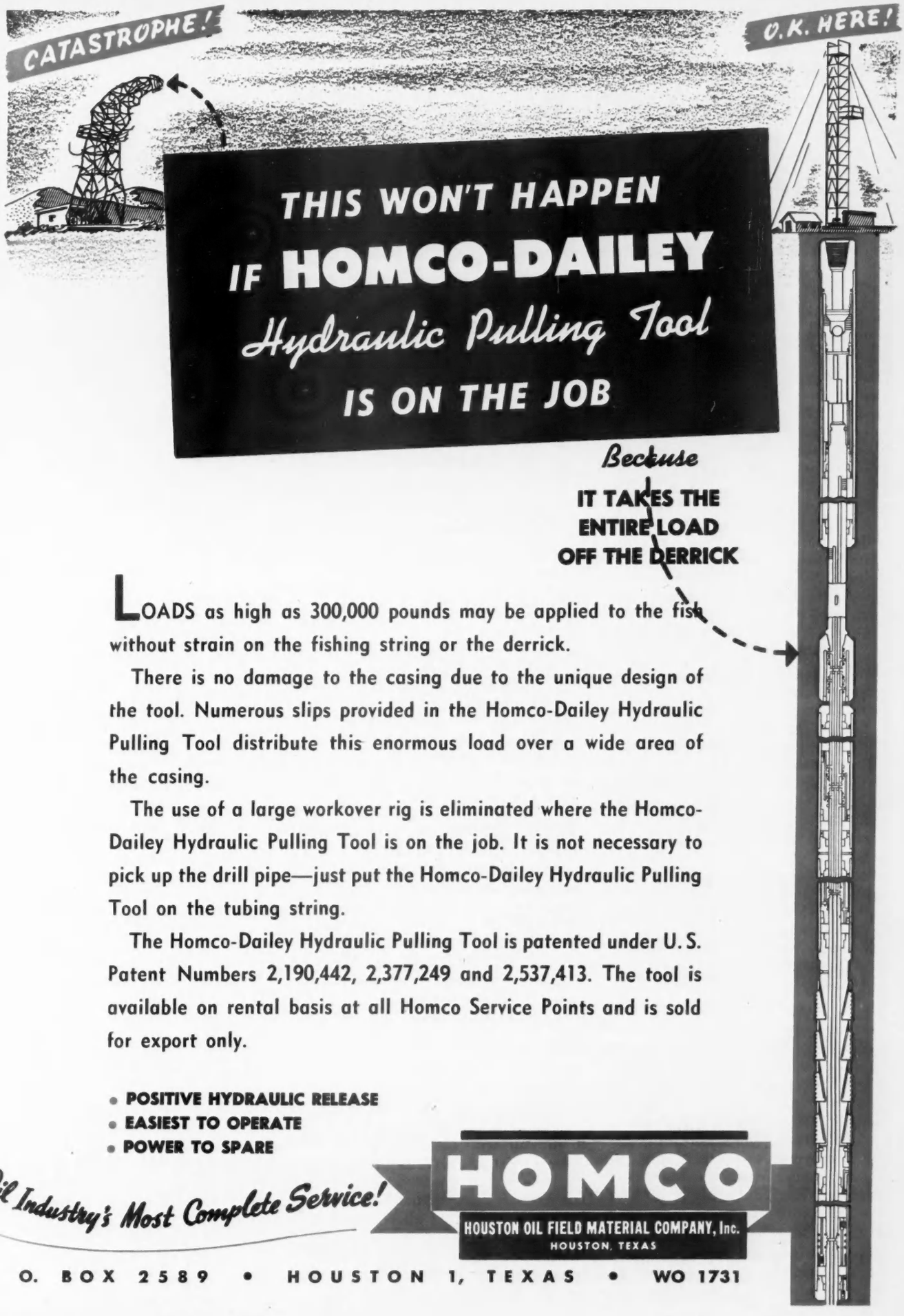
In completing the well, a production packer, run in and pressure-set with an electric line in much the same manner as is the open-hole bridge plug, is set at 6000 feet, or approximately 100 feet above the shoe. About 850 feet of flush joint two-inch tubing is run in the hole, the last joint being equipped with two two-inch tubing seal nipples, locator sub and safety joint. Remainder of the two-inch string, externally upset pipe, then is run in the well.

Instead of leaving rotary mud or crude in the annulus between the casing and tubing, with the attendant danger of corrosion occurring in the months or years that the packer would be in the well, the company has adopted the practice of using crude mixed with a barrel of wood oil. This mixture, which effectively prevents corrosion of either casing or tubing in the annular space, is used in circulating out the drilling mud. This operation is conducted with the tubing string lifted up so that the seal nipples are held up outside the packer. As soon as the mixture is circulated to the surface, the seal nipples are set down inside the packer, the wellhead connections installed, and the well swabbed through the tubing until the flow cleans up.

If the well flows naturally, the formation is treated with 750 gallons of jellied acid, 5000 gallons of regular acid, then 1000 gallons of jellied acid and, finally, 10,000 gallons of regular acid. If the well does not flow naturally, it is treated first with 2500 gallons of regular acid, followed by 750 gallons of jellied acid, then 5000 gallons of regular acid, a 1000-gallon charge of jellied acid and, finally, a 10,000-gallon charge of regular acid.

A typical clearfork well in the particular area now being developed usually flows at a rate of around 35 barrels per hour on potential test. Gravity of the oil is approximately 39 degrees API, with a gas-oil ratio averaging about 875. A pressure of about 550 pounds per square inch is carried on the tubing.

At the time of this writing, the company has completed 32 wells using this program and in that time has experienced no difficulties, fishing jobs or production problems of consequence. Much of the record is credited to the efficiency of this recently-instituted drilling and completion program.



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Gas Lift Practices in West Texas

By J. R. HAMILTON

Fort Worth Production Division, Gulf Oil Corporation

GAS LIFT practices by Gulf Oil Corporation, largest gas lift operator in the Permian Basin, are presented to show the status of this method of lifting fluid from wells. The author briefly describes both methods of gas lift and discusses some of the problems inherent in these practices in West Texas.

THE decline of many oil reservoirs in the Permian Basin past the flowing stage has resulted in increased application of gas lift. The present favorable position of gas lift in competition with other means of artificial lift has been achieved only after much research, development of equipment, and many slow and sometimes expensive field trials. Despite early setbacks, the method that began in West Texas as a troublesome experiment by a few engineers has been generally accepted as a practical and economical means of artificial lift.

In November, 1950, Gulf Oil Corporation had 494 gas-lift wells in West Texas using outside gas. Those wells produced during that month, 290,611 barrels of oil, 863,555 barrels of fluid, and used a net total of 689,682 Mcf of input gas. The average input gas-oil ratio was 2373 cubic feet per barrel, and the average gas-fluid ratio was 799 cubic feet per barrel. In addition to the wells using outside gas, there were 27 flow valve wells using well gas. Those wells produced 17,746 barrels of oil and 45,433 barrels of fluid in November. There were also 43 flow valve wells not being produced because of high gas-oil ratios and other reasons. The above data are shown in Table 1.

Gas-Lift Methods

Data presented on Gulf's gas-lift wells are averages of a wide range of conditions, both in reservoir characteristics and in combinations of flow valves and other equipment. Standards have been evolved in makes and types of equipment for certain fields, and improvements in their application are under constant study. All gas lift in West Texas may be divided into two basic methods: continuous flow and "slug lifting."

The continuous flow method consists of aerating a fluid column to the point where the pressure exerted by the flowing fluid column is less than the flowing bottom-hole pressure at the point of gas injection. Release of the reservoir pressure, and continuous aeration of the fluid column causes fluid to be delivered to the surface. The continuous flow method is being used economically and efficiently to lift considerable quantities of fluid, usually from comparatively shallow depths.

There is still some disagreement among engineers as to whether differential-type flow valves should be considered a means of continuous flow. Differential-type valves operate intermittently in many cases, and actual continuous flow with those valves is sometimes inefficient; however, in this discussion differential-type valves will be included as continuous flow.

"Slug lifting" is a gas lift term to describe the method of intermittent injection of gas into a fluid column to lift a solid "slug" of fluid to the surface. Intermittent gas lift is used mostly in wells with low fluid levels and low productivity, and it has recently been applied successfully to produce prorated allowables from great depths.

To employ profitably either of the basic methods of gas lift, it is necessary to have up-to-date information on the reservoir and individual well conditions. Some indications of those conditions are formation gas-oil ratio, productivity index, bottom-hole pressure and temperature, temperature and pressure gradients, static fluid level, corrosion, sand, paraffin, emulsion, and scale deposition. There must, of course, be a dependable supply of gas available in sufficient quantity at the proper pressure. The supply of gas should be assured at least for such time as is necessary to pay out the installation of the gas lift equipment.

When reservoir characteristics and other conditions are known, the necessary gas pressure and volume, flow valve setting, probable lift efficiency, etc., may be calculated from basic formulas. These formulas are readily available to the engineer, and a detailed discussion of them is not pertinent to this report. Instead, consider the capabilities and limitations of the two basic methods already described, as well as performance data on typical installations of each type.

Continuous Flow Method

The continuous flow method is most commonly used in wells with high fluid levels and high productivity, such as in the Hendrick reef lime, or Ellenberger fields where water encroachment is a major problem. Operations of one company in the Hendrick field provide the best example, for it has the largest number of gas lift wells in that field, and its practices are generally followed by other operators. Maximum production from one well is 20,000 barrels of water and 100 barrels of oil per day, being lifted from 900 feet by casing flow with jet collars. The input gas-oil ratio is 5000 cubic feet per barrel, and input gas-fluid ratio is 25 cubic feet per barrel. The tubing and casing strings are three-inch and seven-inch, respectively. The

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COMPLETE INTER-CHANGEABILITY

For the average well, producing from 100 to 300 barrels of fluid per day, the Type "O" Valve is recommended. Where production is less than 100 barrels per day, the Type "O-BP" Valve is used in conjunction with an accumulation chamber. Both valves are designed for "intermittent" flow.

INTERMITTENT FLOW

Where daily production exceeds 300 barrels, the Type "O-CF" Continuous Flow Valve is usually most desirable. This valve permits maintenance of the original injection pressure down to the producing level. On tubing flow these installations produce up to 4000 barrels per day, on casing flow, from 4000 barrels up to the casing limits.

CONTINUOUS FLOW

Where the working fluid level is *known*, a valve which may be retrieved from the surface by a wire line is highly desirable. The Type "W-OBP" Valve is of this type and is recommended for use in low productivity wells where accumulation chambers are normally necessary and where the retrievable feature is desired.

RETRIEVABLE VALVES

At certain stages in their flowing life, many wells can utilize accumulated formation gas in the casing for assistance in lifting. The Type "G-O" Valve permits use of such gas during these periods, with the added advantage that they may be used for gas lifting with outside gas when it becomes necessary.

TWILIGHT FLOW PERIODS

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YOU COULD BE GAS LIFTING ?

pressure of the input gas is 350 to 400 pounds per square inch at the wells.

A more representative example for the Hendrick field is a well producing 3500 barrels of water and 25 barrels of oil from 1600 feet by tubing flow with differential-type flow valves, with an input gas-oil ratio of 8500 cubic feet per barrel and an input gas-fluid ratio of 60 cubic feet per barrel. Tubing and casing sizes are three-inch and 9⅝-inch, respectively.

Continuous flow is not recommended for gas lift wells with a low rate of production, due to a loss in efficiency at lower rates of flow. Some operators have wells on continuous flow at low rates of production, but that group is diminishing.

The depth at which continuous flow can be used is limited by the operating gas pressure and the flowing fluid gradient. The usual conditions in West Texas do not permit continuous flow below 4000 feet; however, with a surface input pressure of 1000 psi and a flowing fluid gradient of 0.10 psi, it would theoretically be possible to lift from approximately 10,000 feet.

There are two practical limitations on the depth on continuous flow. One is the lack of control of the operation of differential-type flow valves, especially when a well must be unloaded through successive valves down the hole, then be operated from valves at a great depth. Equilibrium conditions are sometimes established in which it is impossible to close the differential-type valve, or the valve may be opened and insufficient aeration occurs to produce the well. The other limitation is the strength of the bellows in the pressure-controlled continuous flow valve. The bellows in some types will withstand a pressure of only about 900 psi.

An example of deep lift with the pressure-controlled continuous flow valve is a well in the Big Lake field that is being lifted from 6000 feet with 600 psi surface pressure. The well produces about 600 barrels of fluid per day, 70 percent water, through three-inch tubing with an input gas-fluid ratio of 800 cubic feet per barrel. A number of different types and makes of differential valves were used in this well prior to the present pressure-controlled installation. Some were reasonably successful, but the input gas-fluid ratio was nearer 1000 cubic feet per barrel or higher.

Slug Lifting Method

By far the most widely used gas lift installation is the intermitting type, with pressure-operated flow

TABLE 2

Recapitulation—Gulf Leases in West Texas, November, 1950

1. No. Flow Valve Wells	564
a. Using Outside Gas	494
b. Using Well Gas	27
c. FV Wells Off Production	43
2. Bbls. Oil Produced by FV Wells	308,257
a. By Wells Using Outside Gas	290,611
b. By Wells Using Well Gas	17,746
3. Bbls. Fluid Produced by FV Wells	908,988
a. By Wells Using Outside Gas	863,555
b. By Wells Using Well Gas	45,433
4. Total Input Gas Volume—Mcf	750,383
a. From Gas Wells	110,913
b. From Gulf Compressor Station	284,168
c. From High Pressure Separators	188,578
d. From Other Compressor Stations	164,867
5. Estimated Leakage—Mcf	27,793
6. Estimated Fuel—Mcf	32,908
7. Net Gas Delivery to FV Wells Mcf	689,682
8. Input Gas-Oil Ratio	2,373
9. Input Gas-Fluid Ratio	799

TABLE 2

Estimate of Cost of Equipment for a Complete Gas Lift System, February, 1951

General Information

Number of wells to be lifted:	122
Length of field:	4 miles
Width of field:	2½ miles
Seven compressor plants to be centrally located among groups of 15-20 wells per plant. Total capacity of plants:	15,000 MCFPD
Total oil per day with all wells making allowable:	18,300 barrels
Estimated maximum total fluid per day, all wells:	24,400 barrels
Gas volume required, at an input gas-fluid ratio of 600 CFPD:	14,640 MCFPD
Suction pressure of compressor plants:	30 psi
Discharge pressure of compressor plants:	600 psi
Average depth of wells:	5,000 feet
Average depth of lift:	3500-4000 feet
Size of casing:	5½" OD
Size of tubing:	2⅜" OD
Wells to be produced by continuous flow:	61
Wells to be produced by intermitter:	61

All lines laid and welded, with high pressure lines ditched and back-filled.

Estimated Cost

Compressors:	
Packaged units, slow speed heavy-duty compressors. Seven 400-HP at $55,000 each:	$385,000
Surface Lines:	
High pressure distribution system:	
4" — 19,700' at $1.00/ft.	19,700
2½"— 48,000' at $0.65/ft.	31,200
2" —113,000' at $0.50/ft.	56,500
Low Pressure:	
8" (from separators) 26,000' at $2.02/ft.	52,500
10" (trunk line) 10,000' at $2.63/ft.	26,300
Flow Valves:	
122 sets at $1,386 average maximum per well:	169,000
Packers:	
122—5½" x 2" heavy-duty with control head at $240 each:	29,300
Fittings:	
Plug valves, orifice fittings, miscellaneous connections at $200 per well:	24,400
Surface Controllers:	
Time cycle intermitters—61 at $288.75 each:	17,500
Total Cost	$811,400
Average Total Cost Per Well	$ 6,651

Estimated Cost of Gas Lift During 10-Year Amortization Period

Year of Operation of System	Amortization and Interest Cost Per Barrel of Oil	Estimated Operating Cost Per Barrel of Oil	Estimated Total Cost Per Barrel of Oil
1	$0.0547	$0.035	$0.0897
2	0.0528	0.036	0.0888
3	0.0510	0.037	0.0880
4	0.0492	0.038	0.0872
5	0.0475	0.040	0.0875
6	0.0456	0.042	0.0876
7	0.0437	0.044	0.0877
8	0.0418	0.046	0.0878
9	0.0400	0.048	0.0880
10	0.0383	0.050	0.0883
11	0.0000	0.055	0.0550

NOTE: Amortization of original investment is 10 percent per year. Interest is 5 percent per year on the portion of the initial investment not already amortized. All costs based on a daily oil production of 50 barrels per well, and a maximum daily fluid production of 200 barrels per well. Operating costs are estimated to be $0.055 per barrel maximum, and include all operating, maintenance insurance and direct costs to surface and subsurface gas lift equipment. (Lease repairs, maintenance of non-gas lift equipment, some overhead, etc., that is charged to wells in Gulf's accounting system are not included in this estimate.)

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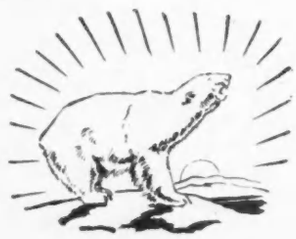

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valves and time-cycle controllers on the input gas. Intermittent valves actuated by a wire line weight bar are the second most common.

Maximum production by slug lifting is limited by the frequency of the intermitting cycle, and the maximum amount of fluid that can be produced in each slug. Ordinarily it is not possible to produce intermittently with cycles of less than ten minutes' duration. The depth of lift, tubing size, input gas pressure, viscosity and specific gravity of the fluid and other conditions affect the capacity of an intermitting installation. Experience has shown that under usual conditions the maximum capacity is 500 to 600 barrels per day at a depth of lift of 5000 feet or less. The capacity is reduced to about 350 barrels per day when lift is from 8000 feet, and the capacity is probably less at greater depths.

Minimum limits of production are one or two barrels per day. Stripper wells with such low production are actually being gas lifted. Intermitting flow is being used throughout the range outlined by the above maximum and minimum limits.

The rule of thumb of 100 psi of operating pressure per 1000 feet of lift has usually been followed in shallower intermitting wells. This still seems a good guide at depths of 4000 feet or less, and a minimum pressure of 250 psi is preferred. More recent experience has proved that 400 to 500 psi is sufficient at depths from 4000 to 6000 feet, 500 to 600 psi at 6000 to 8000 feet, and 600 to 700 psi at 8000 feet and below.

About the Author

J. R. HAMILTON, assistant zone engineer in Odessa, Texas, attended Texas Tech two years and was graduated from the University of Oklahoma in 1944 with a B.S. Degree in Petroleum Engineering. He was employed by Gulf in 1947 as a petroleum engineer in the McElroy field. In 1949 he became the area petroleum engineer at McElroy, and in the early part of 1951 was assigned the position he now holds in Odessa.

A recent intermitter installation in the Pegasus field is producing 60 barrels of fluid per day, 25 percent water, from an operating depth of 12,900 feet. Sixty barrels of fluid per day is the maximum capacity of the well. The bottom valve has a test block closing pressure of 700 psi, and the surface closing pressure when operating from bottom is 523 psi. This well was completed in Ellenberger, and has a high bottom-hole pressure but very low productivity index. The well has been acidized and unloaded three times with the valves in the hole, and no swabbing has been required to unload the well.

In the North Ward-Estes field, gas lift was used to produce wells of the stripper type mentioned before. These wells each produced at an average of below ten barrels of oil per day. Very little water accompanies the production, and the input gas-fluid ratio is in the order of 3600 cubic feet per barrel. Most of the wells in this field have wire-line-operated valves, accumulation chambers, and macaroni strings below packers to allow production from as near total depth as possible. The approximate depth of lift is 2725 feet. Input gas pressure is approximately 350 psi. Accumula-

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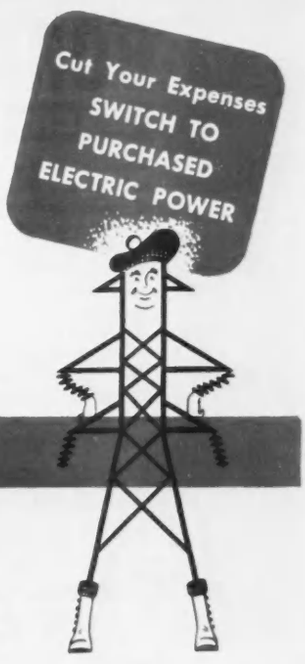

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tion chambers and macaroni strings are often used in wells with low fluid levels. Packers are used to seal the tubing-casing annulus below the flow valves in all but wells with high operating fluid levels. The eductor tube is usually the two or 2½-inch tubing in the well. Time-cycle controllers are all similar in design, and simply perform the function of opening and closing motor valves on input gas lines. Wireline-operated valves are limited to use in non-corrosive areas.

Economics of Gas Lift Installations

The economics of selection of artificial lift methods could be the subject of a detailed discussion for each field in West Texas. The usual economic advantages of gas lift over other methods are a lower initial investment for equipment at each well, and lower operating cost, provided that a cheap source of gas is available, corrosion is not too severe, and the limits of efficient gas lift are not exceeded. Some contend that gas lift is economical because less pumper and other field labor is required to operate wells on gas lift than wells produced by beam pumping. That may be true, but no definite instances in which the field labor force was materially changed by the conversion to gas lift equipment or even by the use of automatic control equipment on gas lift wells have been observed. It has also been our own experience that any saving in pumper labor will be more than offset by the number of engineers and semi-technical service men required for operation and maintenance of gas lift systems.

A few economic disadvantages observed are the unexpected loss of gas supplies, the increased cost of input gas, corrosion in systems with sour input gas, paraffin acumulations, and the necessity of educating non-technical personnel to operate gas lift wells.

One of the most controversial questions in artificial lift economics has been whether gas lift is merely an intermediate means of lift, and, if so, when in the producing life of a well should gas lift be employed. Again this is a question that must be decided from information on specific problems; however, we have proof that some reservoirs are being depleted with gas lift that could not otherwise have been depleted to the present stage. There must also be other reservoirs in which it would not be economically sound to produce to depletion with gas lift. In general there does not seem to be enough of an issue involved to justify an attempt to make a definite rule on the question.

In few instances has it been possible to place a large number of wells on gas lift at one time, and provide an adequate and long-range gas compression and distribution system at the beginning of gas lift operations. The wealth of knowledge and experience gained in gas lift in West Texas in the last few years is enabling more operators to proceed with confidence in the execution of such large-scale plans.

An interesting cost estimate for a complete system was prepared recently for a major oil company by gas lift equipment engineers. The system is to serve 122 wells in an area four miles long and 2½ miles wide. "Packaged" compressor units were to be centrally located in groups of 15 to 20 wells per unit, and were designed to compress a total of 15,000 Mcf per day of input gas from 30 to 600 psi. The estimated maximum production per well was 200 barrels per day, to be lifted from depths of 3500 to 4000 feet, if necessary. Table 2 gives a breakdown on the estimate. It is significant that the total cost of all surface and subsurface equipment was $811,400, or $6651 per well. The average estimated cost per barrel of oil produced for amortization and in-

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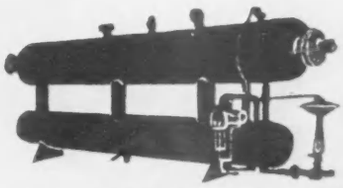

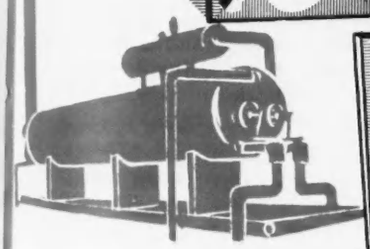

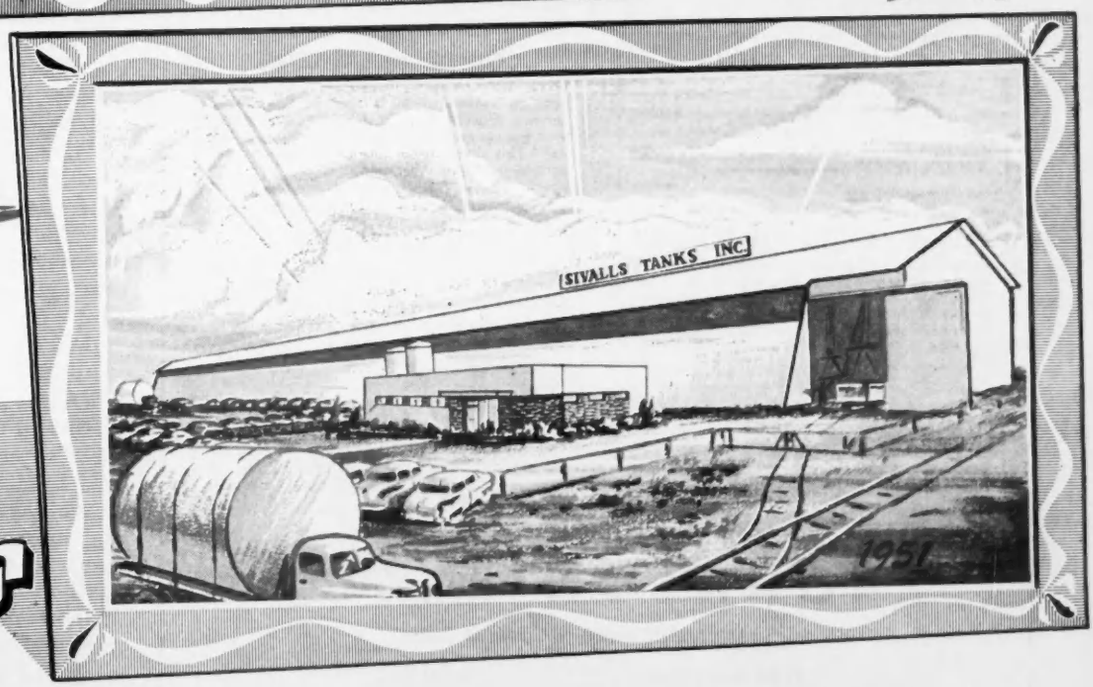

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terest on investment and operating cost of the entire system during the ten-year amortization period is $0.081.

The estimated operating cost averaged only $0.035 to $0.050 per barrel, based on costs of similar systems and an average of one tubing job per well per year. That estimate did not include lease repairs, general overhead, and maintenance of non-gas lift equipment that must actually be charged back to the gas lift operations.

It is not necessary to purchase gas for the system just described, and no market for produced gas exists at this time. In fields where input gas must be purchased for as much as 5½ to 6 cents per Mcf, and the gross produced gas is either flared or sold to gasoline plants for less than the price of input gas, then the economics are much different. It is the increasing market for gas produced in West Texas, and the reluctance of some gasoline plants to recycle gas lift gas, that creates much of the economic problem in obtaining gas supplies.

Operating Problems of Gas Lift Systems

SUPPLY OF GAS: The supply of gas is an operating as well as economic problem for some gas lift systems. Most of the input gas used in West Texas comes from compressor stations, and those in turn usually receive residue gas from gasoline plants. The second most important source seems to be gas wells, and the third is high-pressure separators on oil wells.

One cause of the supply problem has been the unavoidable inability to predict the eventual gas needs when a gas lift system was first begun. For example, a few wells needing artificial lift may have been connected to a high-pressure separator by small-diameter lines. Then later, as the first gas lift installations proved economical, more wells were added to the system until the required input volumes exceeded the capacities of the small lines. It has happened that the capacity of the well supplying the gas declined or the allowable of the supply well was reduced. In some cases a supplemental source of gas was not available, but it has nearly always been possible to continue gas lift at a profit by rearranging or decreasing the size of the system. The planning of large systems, and the use of small "rotating" compressor systems for one or more wells should reduce the overall supply problem.

CORROSION: Another serious operating problem is corrosion. Large numbers of gas lift wells are operated in the Goldsmith, Penwell and McElroy fields, where corrosion is more severe than in most other gas lift systems. At McElroy, corrosion from the sour input gas has caused such replacement of tubing and subsurface equipment that it is not economical to gas lift wells with low allowables. The compressor station and transmission lines have also suffered heavy damage from corrosion.

Several methods have been devised to combat corrosion in gas lift systems. Inhibitors and hydrogen sulfide neutralizers have been injected into the input gas. Equipment is made of corrosion-resistant alloys. Protective coatings for tubular goods are also used with varying success.

PARAFFIN: The accumulation of paraffin in tubing and flow lines restricts the flow of gas lift wells, causes inefficient use of input gas, and sometimes causes a well to cease producing. Probably the worst situation is in the McElroy field, where the tubing must be mechanically cleaned about once a week. Flow lines on all wells at McElroy, regardless of lift method, must have the paraffin removed about every ten days.

Automatic paraffin scrapers have been used in tubing with limited suc-

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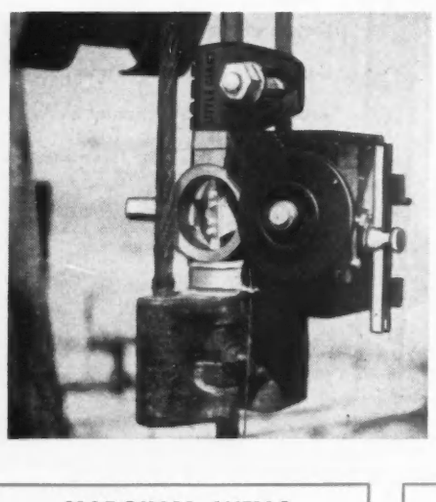

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cess, as the flow characteristics of some gas lift wells interfere with the travel of the scraper. Some newer formulas for plastic coatings are being tested in tubing to prevent paraffin deposition.

SCALE: Scale forms in the tubing and flow valve mechanisms of some gas lift wells that produce water. That is particularly true of wells producing from the Ellenberger reservoirs. Some chemical solutions have been injected with input gas to prevent scale formation. Chemical treatment is complicated by the variations in chemical composition of scale in wells. One well may have calcium sulfate scale and an offset well may have calcium carbonate scale. In some cases scale must be removed from tubing periodically by mechanical means.

Gas Lift Developments

There are several new developments in gas lift equipment that promise to improve and enlarge the range of gas lift practices in West Texas. One is the small recycling compressor unit with automatic control equipment. Another is the free-traveling plunger used to lift slugs of fluid in intermitting wells. That equipment is not entirely new to West Texas, but recent refinements are now being tested.

Many dually-completed wells are declining to the point that they must be produced by artificial lift, and gas lift is particularly adaptable to such wells. Equipment is being marketed which allows almost any combination of flowing arrangements through casing, tubing, or macaroni strings.

Summary

This investigation has revealed that gas lift is being adopted as a means of artificial lift in West Texas under a wide range of economic and operating conditions. It is being used to economically deplete wells producing such high volumes of water that they could not be produced by other common means of artificial lift. Economic depletion of a large number of wells with low fluid levels and very low fluid capacities is being accomplished where sand conditions prevent the use of conventional pumping equipment.

Gas lift methods in West Texas may be divided into two general classifications: those of continuous flow by aeration of a fluid column, and "slug lifting." The former method is most applicable to wells having high operating fluid levels and high productivity. The latter method is used in the majority of gas lift wells. Intermitter "slug lifting" is being accomplished in some of the deeper pay zones penetrated to date in West Texas. Certain practical limitations have been determined as to the maximum amount of fluid that can be produced by slug lifting; however, the limitations are high enough that prorated daily oil allowables can be produced if water production is not excessive.

Several serious operating problems are encountered that affect the economics of gas lift. Indications of some of those problems are corrosion, paraffin, scale, and a limited or expensive supply of gas.

Experience that has been gained in the last few years in the application of gas lift theories and methods has brought gas lift to a favorable position as an economical means of artificial lift. That background of experience, the continuing decline of flush reservoirs, and the constant effort to improve gas lift equipment and practices should point the way to expanded use of gas lift in West Texas.

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External Corrosion Of Gas and Oil Well Casings

By C. I. SIMS
Consulting Engineer, Dallas

THE AUTHOR cites the corrosion hazard in surface casing strings, and indicates how they may be protected through insulation of flow lines to eliminate the flow of stray currents into the unprotected casing. A survey of a gas line tied in on six wells indicates current fluctuation in intensity and direction, emphasizing the danger of serious metal loss at hot spots in system.

CORROSION on the external surface of gas and oil well casings has taken a heavy toll in metal, consequently creating hazardous conditions where the well pressure is sufficient to cause leakage of gas near the ground surface.

Corrosive action is evidenced by pitting and scaling which eventually will cause a failure of the casing. This metal loss is partly the result of electric current flowing into the well from the connecting pipe line system and then leaving the casing at a depth where the soil resistance is very low. The rate of deterioration for average pipe steel is 20 pounds per ampere per year. The origin of this current may be from stray earth currents, or it may be from galvanic action due to the various acids and salts in the soil in conjunction with the steel pipe. This action is similar to the generation of current by a battery. The galvanic cell may be minute in size or quite large, depending on soil conditions.

Practically all of the oil and gas wells in service have a surface casing varying in length up to approximately 1000 feet. This surface casing is intended to prevent blowouts where high pressure gas is encountered or at least to provide double safety against such possibilities.

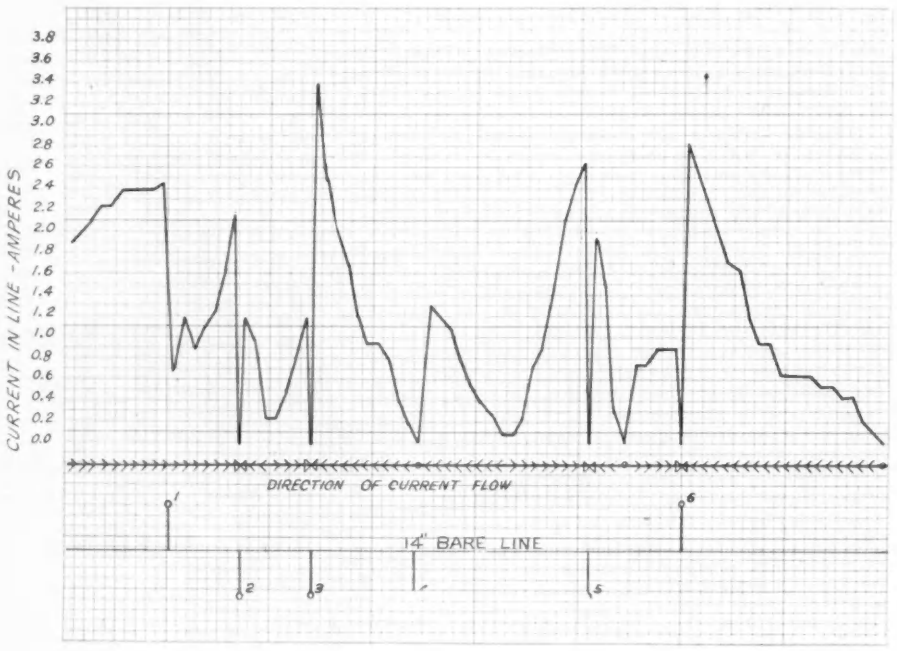
The previously mentioned flow of current into the wells has in the majority of cases flowed from the surface casing to the soil instead of from the main casing string to the soil. Therefore, the surface casing is the sacrificial metal until the annulus space between the two casings is filled with liquids and soil through penetrations of the surface casing from corrosion. It is then quite probable that corrosion will become active on the main casing string. The time required for failure of the casings varies greatly, depending upon the amount of current drainage and the concentration of the current in leaving the pipe. Some wells have experienced this trouble in about ten years. Should there be no surface casing, as is the condition in some gas and oil wells, then failure can occur much sooner.

This writer has had the opportunity of witnessing the large area surrounding high pressure gas wells where gas leaks from corroded casing have penetrated porous oil formations and surfaced as far as 1500 feet from the well. However, the first evidence of this condition is usually found in the near vicinity of the well. Regardless of the depth at which casing failure occurs, an expensive workover job is necessary before resuming normal production.

Numerous wells have been tested for current drainage in both the coastal and inland dry areas, with the result that there seems to be no appreciable difference in the general conditions.

Oil wells drilled very near each other and electrically connected by small flow lines do not have the heavy current drainage which is prevalent with wells widely separated. The primary reason for this is the pipe line connecting the widely separated wells offers less resistance to current pickup due to more pipe-to-soil contact than the shorter lines.

Considerable trouble has been ex-



Corrosion survey on short section of gas gathering system.

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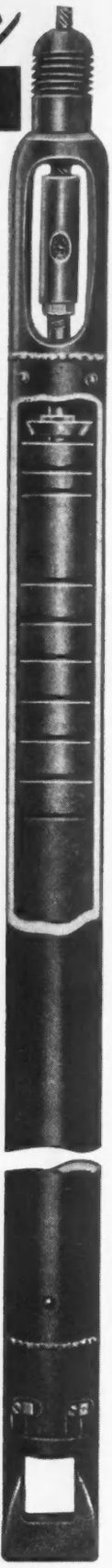

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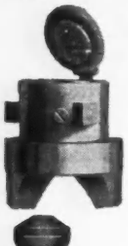

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perienced by many companies from internal corrosion, such as oil well tubing, sucker rods, pipe lines, and all metal in contact with the products which are produced or transported. Again, this action is probably due to galvanic corrosion, but is not necessarily the result of any current that may or may not be flowing into the wells from the connecting pipe line. The local corrosion where products are involved have many tiny cells that are complete circuits for the flow of current from the metal surface to the liquid electrolyte and back to the metal surface again, with the corrosion or pitting always occurring at the point where the current leaves the metal.

One of the most efficient and economical methods for substantially reducing external corrosion in oil and gas wells is to install insulated flanges, nipples or couplings in the flow lines at a point near the well. This insulation blocks the flow of current into the well, thereby eliminating corrosion in direct proportion to the amount of current blocked off. After the insulating material has been installed in the flow lines, there will probably be some active corrosion from the different soil formations with which the casing is in contact. This, again, will be of galvanic nature; however, it will not be so severe or concentrated.

The accompanying chart illustrates the results of a corrosion survey on an eight-mile section of gas gathering system near Dumas, Texas, and owned by Shamrock Oil & Gas Corporation, Amarillo, Texas. Purpose of this survey is to show the amount of current drainage into wells and the irregularity of its actions. This survey was made before insulating any of the wells from the pipe line system. The main line is a 14-inch uncoated line and the lateral lines are four and six inches in diameter and are not of equal distance to the wells even though shown to be so on chart. The method of survey was to make contact with the line by probe bars every 500 feet and measure the potential drop between the two points, using a high resistance millivolt meter with a 500-foot number 14 copper wire shunt. The potential drop in millivolts can then be converted into amperes and plotted as shown on chart. The straight line with arrows directly above the 14-inch bare line shows the direction in which the current is flowing at each measurement point. It is necessary to know this because the amount of current and the direction of flow determines where the current is entering or leaving the line. It will be noted that different type arrows are drawn when current drains off the main line from both directions at a local point. It is a well established fact that this current causes corrosion such

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as pitting and scaling when it leaves the metal structure to enter the soil or liquid electrolyte, and prevents corrosion when the process is reversed.

The first measurement on the chart shows 1.9 amperes in the line flowing to No. 1 well. This amount gradually increases to 2.45 amperes at the well lateral and then drops to 0.7 ampere, which indicates that 1.75 amperes will flow into the No. 1 well lateral. There will be an increase or additional pickup of current along the lateral line to No. 1 well, which will total more than the 1.75 amperes that left the 14-inch line.

At wells Nos. 2, 3, 5 and 6, all of the current in the main line is flowing to those wells and in each instance the current is entering those laterals from both directions along the pipe line. For example, the lateral to No. 2 well is taking 2.2 amperes from one side and 1.2 amperes from the other, making a total of 3.4 amperes leaving the main line for No. 2 well.

The No. 4 well drains off all current in the main line; however, this current is from only one side of the lateral tie-in. When any one well does not completely drain off all current in the main line, such as the No. 1 well, it is because the length of the lateral line to No. 1 well is greater than the total distance to the next connected well.

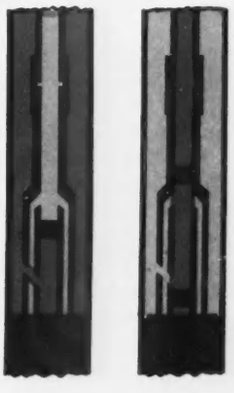
There is one other feature to this type of survey revealing corrosive areas or "hot spots" such as on the chart between Nos. 1 and 2 wells. There is a current drop off of 0.3 ampere in the 500-foot area beginning 1000 feet from No. 1 well. This particular "hot spot" was an area totaling approximately 200 feet along the pipe line and the soil was of clay texture with much lower resistance than the adjoining soil. When the corrosive areas are found by this type of survey, and the engineer in charge wishes to know the exact area of potential corrosion, then soil resistance measurements can be made every few feet along the line for this purpose.

As previously stated, this survey was made before installing insulated flanges to prevent the flow of current into the wells. If the same survey should be made after insulating, the sharp dips and peaks representing current would be eliminated, and probably at no place would there be more than 0.5 ampere in the line.

It is evident from the chart that the current which damages the well casing actually offers some protection to the pipe line at those areas where it is collecting on the pipe; however, in many instances the line would not experience corrosion should there be no protective current, due to the non-corrosive nature of the soil.

cross over under pressure

The Otis "Selective" Cross-Over Packer — made up in the tubing string as permanent sub-surface equipment — is the only cross-over packer on the market which allows an operator to "select" his flow courses from the surface *without killing the well and round-tripping the tubing and changing packers.* He "selects" parallel or crossed-over flow courses as desired simply by running in a wire line choke. The diagrams at right — simplified for clarity — illustrate the Type X Choke, which directs the lower zone *(blue)* through internal passages in the packer to cross over into the casing; simultaneously the upper zone *(red)* is routed into the tubing. The Type R Choke allows both zones to flow parallel — the lower *(blue)* through the tubing and the upper *(red)* through the casing. The packer and chokes seal off gas-tight, and the fluids do not comingle at any time.



In these days of pipe shortages, don't complete — or recomplete — another well until you obtain full particulars on this equipment. Ask your nearest Otis office, or contact us in Dallas. There's no obligation, and afterwards you'll be better prepared to obtain better production from your dual-completions.

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OTIS PRESSURE CONTROL SERVICE - EQUIPMENT

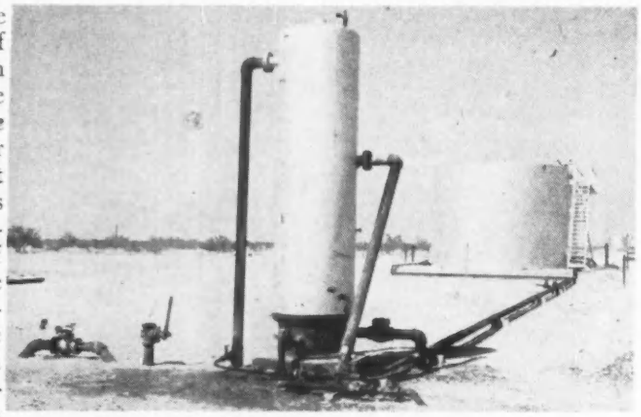
"Selective" CROSS-OVER PACKER

with removable wire line chokes

How to do it! PRODUCTION HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas.

HOW TO—Roll Lease Tanks with Gas from Separators



As long as the BS&W content of the oil is within limits set by the pipe line taking the oil, the operator can best prevent tank cleaning jobs by thoroughly mixing each tankful of oil taken by the pipe line. Connections to the line are not on the bottom of the tank, but usually a few inches above bottom. This interval permits some settling of the heavier material in the oil, and after a long period, a sludge is accumulated in the bottom of the tank unless it is periodically mixed.

Here is a simple method of rolling or thoroughly mixing the contents of a lease tank by using gas pressure available from adjacent separators. The arrangement is such that the tank need only be rolled just prior to discharge of the oil into the pipe line system.

Gas in this case is flared since there is no economical market for it, and as such, is not considered waste when used to roll the tank bottoms. A 1¾-inch tap is made into the gas vent line from the separator with a gate valve attached to the smaller line near the separator. The line follows the separator discharge line to the tank battery where it runs parallel to all tanks. A tee in this gas supply line is connected to each tank near the bottom on the side opposite to the pipe line connection. When the pumper deems it necessary, after a tank has been filled the tank vent can be opened, and the control valve on the small gas supply line from the separator opened. The gas pressure discharging into the bottom of the tank causes the oil in the tank to swirl and thereby thoroughly mix. In this manner, the tanks may be kept fairly free of sludge that ordinarily accumulates in the bottom.

HOW TO—Maintain Level of Water in Cooling Tower

In most pressure maintenance projects, it is necessary to install cooling equipment to reduce the temperature of the compressed gas between stages of compression, as well as to cool the engines driving the compressors. For continuous operations and to protect the compressors, it is essential that the water level in the cooling tower pits be maintained at a constant level. Water pumps circulating the water then have a constant head on the suction and the pumps are prevented from removing all the water and sucking in air.

On the line that discharges water into the pit to make up that lost to evaporation or spillage, a float-controlled globe valve was installed. A three-foot lever of strap steel is attached at one end to the valve control shaft and at the other end pivoted on a vertical steel rod attached to a metal float. As the float rises and falls with the water level in the pit, the lever arm controls the feed water valve to shut off or open the water supply line to fill the water pit to its proper level. When the water level reaches a predetermined point, the float causes the valve to shut off, thereby preventing the pit from filling over.

The float operates inside a larger section of casing, open at the bottom, which rests on the bottom of the concrete pit. The top of this guide casing is held in place by four braces bolted to the concrete walls of the pit. The rod between the float and the lever arm is guided by a short sleeve mounted in the center of a circular steel plate welded to the top of the float guide casing. The cooling water level controller is practically fool-proof, and has operated over a long period with complete satisfaction.

HOW TO—
Construct Sturdy Tool Box for Truck

A sturdy and accessible tool box enables a roustabout crew to maintain the neat appearance of the work truck, as well as have the tools used on each job always handy. It is wise to keep the tool box locked to prevent damage or loss of the tools. A strong tool box was rigged up for the truck illustrated when the truck bed was fabricated in the shop for field use.

The box is made of sheet steel and is of all-welded construction. Attaching the tool box to the bottom of the truck bed allows the surface of the bed to be kept clear, resulting in a larger working area. Important in the design of the box is the means of hinging and locking the lid so that it remains as tight as possible.

The lid opens out and down so that it falls vertically alongside the bottom of the box. The hinge is made of two pieces of sucker rod about 30 inches long, bent into a U shape. A 12-inch section of ¾-inch pipe is inserted over the bottom of the U, and welded to the framework of the box to form a sturdy hinge. The legs of the rods are then welded to the lid.

The latching mechanism is of the lever type so that the box lid can be pressed tightly against the frame. The lever arm of the latch is hinged to the box frame, and when the lid is in place, the lever arm rides on top of a bearing plate. The lever arm is then pressed in place as shown and the large eye on the end of the arm is passed over a smaller eye welded to the lid. A lock secures the lid and prevents the use of tools other than during an authorized job.

Super Performance of

SUPER CUB

MEANS MANY NEW USES FOR PLANES

Imagine how useful a plane can be when it takes off in 100 feet and can land just as short on rough, unprepared terrain. Supplies, tools and emergency equipment can be flown to location. Supervisory personnel can cover more jobs more frequently. Medical aid can be reached in minutes.

You can have such a useful plane at a practical price. The new 1951 Piper Super Cub with 125 horsepower takes off shorter, lands shorter than any plane available today.

This two-passenger, special-purpose airplane is just made to order for use in oil fields. It cruises better than 100 mph yet flies as slow as 33 mph when needed. It can carry nearly a half-ton. The '51 Super Cub is a swift, versatile expediter that will pay for itself many times in time and actual money saved. Easy to fly—anyone can learn quickly.

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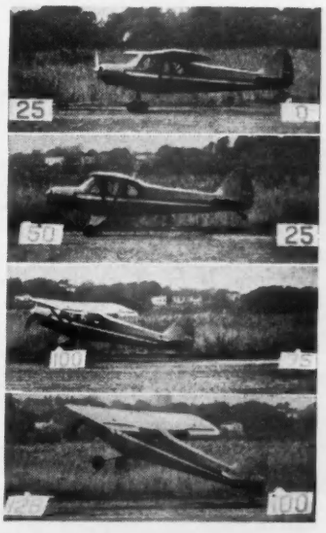
For the most economical executive air travel, choose the 4-passenger Pacer, or Tri-Pacer with tricycle landing gear. Better than 120 mph cruising speed, quiet, comfortable. Let your nearest Piper dealer demonstrate conclusively how you can use a Piper. Write Dept. L-9 for his name and latest literature on new Piper models.

PIPER AIRCRAFT CORP.

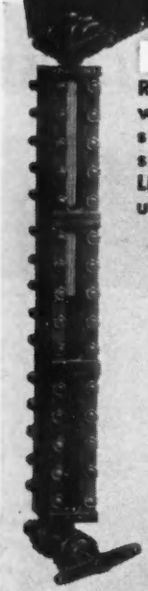
LOCK HAVEN, PA., U. S. A.

HERE'S PROOF!



High-speed sequence camera catches routine Super Cub take-off in less than 100 feet! Markers give distance in feet. (International News Photos)

PENBERTHY
Liquid Level GAGES

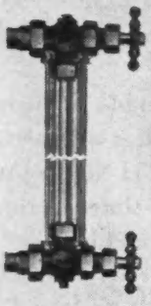


REFLEX

Reflex type complete with gage valves. Liquid shows black—empty space shows white. Liquid level is always unmistakable.

TRANSPARENT

Transparent type complete with gage valves. Used where through vision is desired under high pressures and/or temperatures.

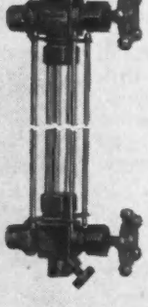


DROP FORGED STEEL

Tubular glass type, Chrome-Moly temperature resisting steel body, stainless steel trim, regrinding removable seats.

ALL IRON

Tubular glass type, extra heavy body of special high strength alloy iron, shanks alloy steel, trim stainless steel, valves self-cleaning.



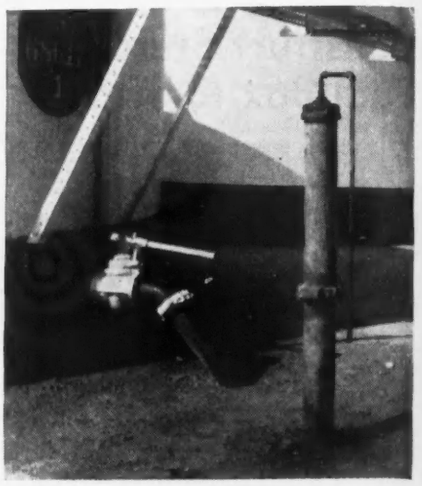
There is a Penberthy Gage of superior quality for every liquid level gage requirement. Gages are fabricated to customer's specifications from special alloys to meet unusual corrosive and temperature conditions. All Penberthy Gages conform with API-ASME requirements.

3277-B

PENBERTHY INJECTOR CO.
Detroit 2, Mich.
Canadian Plant — Windsor, Ontario

HOW TO—

Prevent Pulling Air In Gathering System



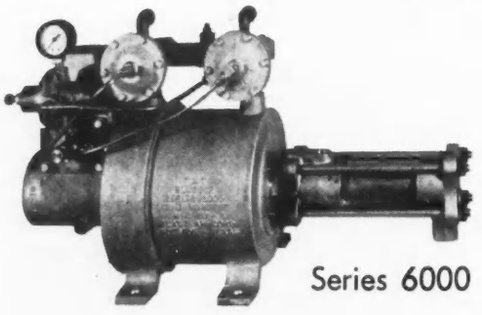
In transferring oil from lease stock tanks to a tank farm or to trunk lines, it is essential that a tank be turned off when the oil is out so that the gathering pumps do not suck in air and thereby create a vacuum inside the tank.

To provide what might be termed an automatic tank shutoff, a floating valve was installed on the drain line from each tank battery. This assembly is a metal float which operates inside a vertical riser attached to the oil gathering system. The unit shuts off the draining of any or all tanks when the oil is drained to a predetermined level. This level is determined by a valve seat placed in the vertical riser shown. As the float lowers in the riser, it drops on the valve seat, thereby stopping the flow of oil into the gathering line. There is only atmospheric pressure on top of the float, but due to the suction of the pumps in pulling oil from the tanks, the differential is sufficient to hold the float in place until the tanks are again filled with oil.

A similar valve seat is placed in the upper part of the riser, so that as the float rises with the oil level in the tanks, it closes the opening into the atmosphere when it impinges upon the seat. A simple pipe cap closing the upper end of the riser is equipped with a one-half-inch breather line to permit free action of the float.

TEXSTEAM

for the finest in chemical pumps



Series 6000

Here's the TEXSTEAM "Slugger" . . . with a capacity of 3 gallons per minute @ 5000 psi pressure! This heavy duty pump has a maximum injection pressure of 10,000 psi, and is designed for continuous slugging of chemicals and inhibitors in producing wells and plants. Complete information furnished upon request.

BETTIS CORPORATION

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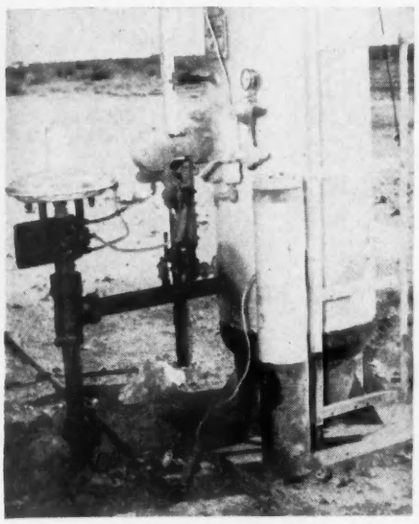
HOW TO—
Use High-Pressure Gas for Controls



Here is a method of reducing pressures of field gas that makes it possible to utilize such high-pressure gas in operating the control mechanism on gas and oil separators. Critical control on high-pressure separators is necessary, and some manufacturers provide equipment which use low pressure control gas as a medium of actuating the liquid dumping mechanism on the separators. In the case shown, the rising of the float inside the separator lifts a bar off the exhaust orifice of the control line to drop the pressure in the control system. As the pressure drops, the diaphragm valve opens to permit the liquid in the separator to flow into the lease stock tanks.

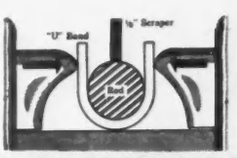
Relatively high-pressure field gas is supplied through the one-inch line lying on the ground at the left. This line is equipped with a valve and reducers to bring the supply line down to half-inch copper tubing which is attached to the middle of the high-pressure scrubber unit. This unit is made of heavy stock and capped with a bolted flange on top. A drain at the bottom permits drainage of liquid or particles that may be removed from the gas.

A copper tube connection from the top of the scrubber leads to a second smaller drip before connecting into a dual pressure regulating unit. These regulators make it possible to closely control the operating pressure of the dump system. The double feature just adds a measure of safety should one regulator become ruptured.

NO PARAFFIN TOO HEAVY

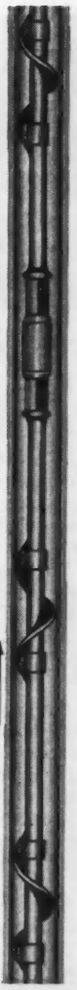
TO WHIP CRALL SPIRAL SCRAPERS

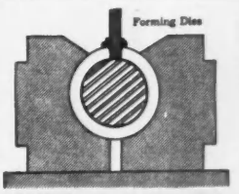
CRALL Spiral Paraffin Scrapers will keep any well free from paraffin. Even in areas where paraffin is unusually heavy, CRALL Spiral Scrapers keep the well cleaned efficiently. Save work-over servicing and stripping jobs, with CRALL Scrapers and you'll be time, man power and money ahead every time.



Cross section showing "U" band being die-formed around rod to the scraper blades.

PASS SCRAPERS EVERY STROKE UP AND DOWN





Cross section showing band held under pressure around rod while ends of band are shrink-grip attached to scraper blade.

- Scrapers alternate—one right, one left—eliminating tendency of the rod to unscrew.
- Scrapers are attached at our fabricating plants and stocked at supply stores.
- Made of thick, mild steel. Sizes to fit 2" and 2½" tubing. Will fit any make of sucker rod. New or used.
- Scrapers are light in weight. The extra load to your rod string is negligible, 150 to 160 lbs. per 1,000 ft.

- No gadgets to fool with. No maintenance cost. Scrapers will not harm rods or tubing.
- Scrapers are placed close enough so they pass or meet each other with each reciprocation up and down.
- Scrapers fit perfectly. Neither scrapers nor bands are welded to the sucker rod.
- In every case CRALL Spiral Paraffin Scrapers pay for themselves many times over.

Order CRALL Spiral Scrapered Rods from your Supply Store, or write, wire or phone . . .

PETROLEUM SPECIALTY CO.

P. O. BOX 1640 PAMPA, TEXAS

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HOW TO—Cool Engine Radiator

Temperatures of 110° are not uncommon in many parts of West Texas during the summer months. Not only is the temperature high, but the air is extremely dry. During the middle of the day, engines in enclosed housings may tend to run much hotter than recommended by the manufacturers. Such was the case with this engine driving a high-pressure pump.

The most common and perhaps the most effective way to cool the air in this arid region is to add moisture to it. In cooling homes, this is done by drawing the air into the house through a mat of excelsior or other suitable material that has a continual stream of water flowing over it. The air, passing through the pores of the wet mat, picks up the moisture and cooling takes place in the dry atmosphere where the moisture tends to evaporate rapidly.

This same principle was employed to cool the air drawn into the engine radiator. A framework of angle iron, supported by extension arms from the engine frame completely covers the radiator area. Quarter-inch mesh galvanized wire was added on both sides of the frame to support excelsior. A simple trough was welded across the bottom of the frame, and a garden hose attached to the discharge of the trough carried the water to a sump. Water was evenly distributed over the excelsior by a half-section of three-inch pipe split down the longitudinal axis and drilled on bottom so that the holes were spaced about two inches apart. A small rubber hose carried water to this distribution trough.

While the engine was running, the cooling fan sucked air through the wet excelsior and thereby picked up moisture and lowered the temperature as much as 15 degrees before the air entered the radiator. This emergency measure was adequate to cool the engine down to operating temperatures during the hottest days of the summer months.

PAGE ON & OFF ATTACHMENT

PAGE TENSION TOOLS

Easy engagement
Easy release
A RUGGED
Rod-to-Plunger Connection

THAT'S THE PAGE

SUCKER ROD ON and OFF ATTACHMENT

The Page On & Off Attachment provides a quick, effective means of joining sucker rods to the pump plunger in tubing and casing pump installations. Its proven design permits removal and replacement of sucker rods without disturbing the pump plunger—a foolproof clutch-type locking mechanism eliminates chance for failure even under the severest of pumping conditions.

The success of the Page On & Off Attachment has prompted many operators to switch to larger volume pumps. The result—immediate payout for the changeover through increased production.

SIMPLE CONSTRUCTION—SIMPLE OPERATION!

Simplicity of construction is the keynote of the Page On & Off Attachment. There are no threads to gall, no complex mechanism to foul up. The tool consists of a male and female section which interfit and interlock when the sucker rods are lowered onto the pump plunger. A ¼ turn left rotates shoulders on the male section into milled out slots in the female section. During rotation a locking clutch engages by force of a helical spring positioned below it.

Disengagement of the tool requires only slight up strain and a ¼ turn right. This forces the clutching sleeve down and permits rotation of the female section for disengagement from the male section. Both the male and female sections are milled and turned from solid billits of steel and are held to close tolerances to virtually eliminate chance for wear.

SEE OUR CATALOG
IN THE COMPOSITE CATALOG

Mid-Continent Distributors
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The Continental Supply Company
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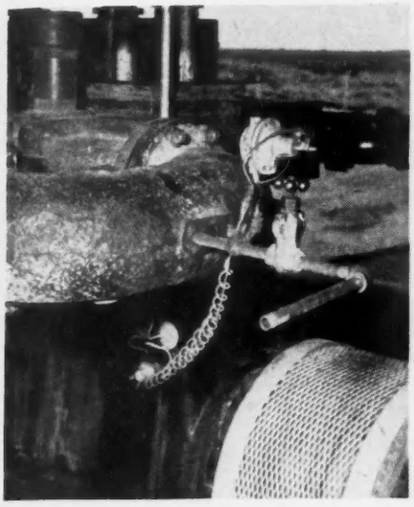
PAGE OIL TOOLS, Inc.
3356 Lime Ave., Long Beach 7, Calif.

PRODUCTION HINTS

HOW TO—
Install Safeguards on Water-Flood Pump



In addition to the many safeguards normally found on an unattended water-flood station located on some remote part of the flood lease, here is a vacuum-controlled switch attached to the suction manifold of the injection pump. This switch grounds the magneto of the engine driving the pump in the event the strainer on the suction line becomes clogged, thereby stopping the engine and pump.

This cut-out switch on the engine's electrical system is converted from a discarded gasoline diaphragm pump taken from a passenger automobile. The bottom of the diaphragm is connected to the suction manifold of the injection pump by means of half-inch piping. A vertical section of this piping supports the light-weight diaphragm and switch.

The actuating rod of the diaphragm is directly connected to a small electrical toggle switch mounted on a bracket attached to the body of the diaphragm. Under normal operating conditions, there exists a slight head of pressure on the suction manifold that causes the diaphragm to bulge slightly toward the toggle switch, which remains open. However, in the event the supply of water is shut off because the suction line strainer is stopped up, the pump generates a vacuum in the suction manifold. A vacuum on the bottom side of the diaphragm pulls the actuating rod in the opposite direction, thereby causing the toggle switch to close and grounding the magneto of the pump engine. The switch remains closed until the vacuum is broken and conditions restored to normal.

MAKE THE RIGHT MOVE

INSIST ON ALTEN SURFACE EQUIPMENT

LUBRICATED STUFFING BOX

STUBBY TUBING HEAD

CLOVERLEAF STUFFING BOX

Alten equipment gives you deluxe features at rock bottom prices.

STOP COCK

WONBOLT POLISHED ROD CLAMP

It costs Alten far more to build equipment so that it costs you far less to operate and maintain it.

THE WORLD'S BEST PUMPING UNIT

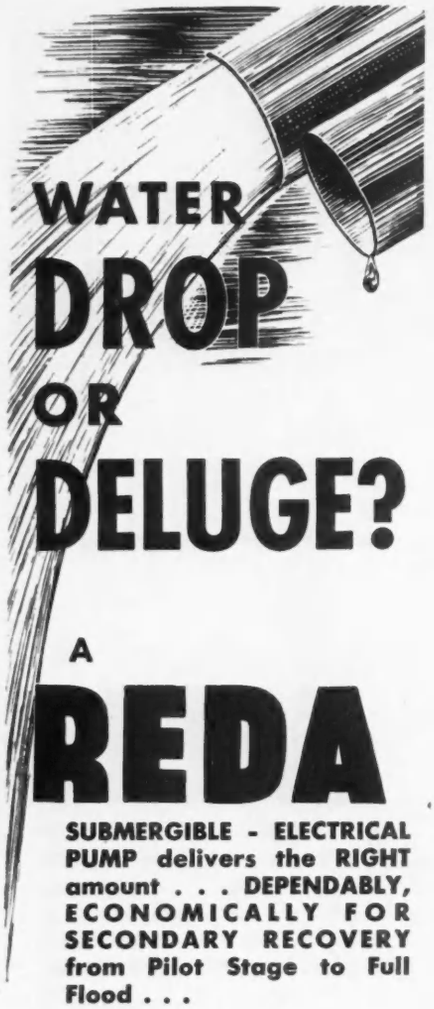
Longest Strokes
Highest Gear Reducer Ratings
plus
Hardest Gear Surfaces

ALTEN

Pumping Units, Tubing Heads, Stuffing Boxes — every piece of equipment in the broad Alten line is fully performance proved. Get more for your money from the smallest Polished Rod Clamp to the largest Pumping Unit by asking your dealer to furnish Alten equipment.

ASK FOR COMPLETE ALTEN LINE
AT YOUR LOCAL SUPPLY STORE

ALTENS FOUNDRY & MACHINE WORKS, INC.
LANCASTER, OHIO



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ENGINEERING DESIGN

Reda Pumps produce the largest volumes obtainable from 5½", 7", 8⅝" casings, often reducing the required number of source wells. Corrosion resistance built into Reda Pumps materially prolongs time between pulling jobs, where corrosion is a factor.

ECONOMY

Reda Pumps reduce investment in number of supply wells required. Reda pumping equipment investment is less per barrel of daily capacity; pumping cost per barrel is lower.

FLEXIBILITY

To fit the changing needs for water volume as the flood progresses, Reda Pump can readily be altered or changed to larger or smaller sizes.

Reda Engineers have been closely associated with WATER FLOOD OPERATIONS for more than ten years and are fully qualified to assist operators in the selection of proper pumping equipment. A letter or phone call will bring prompt results.

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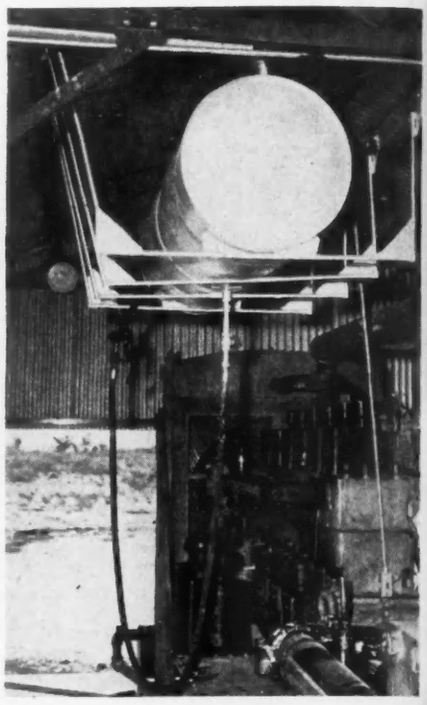
BARTLESVILLE, OKLAHOMA

HOW TO—

Store Lubricating Oil at Pump Station

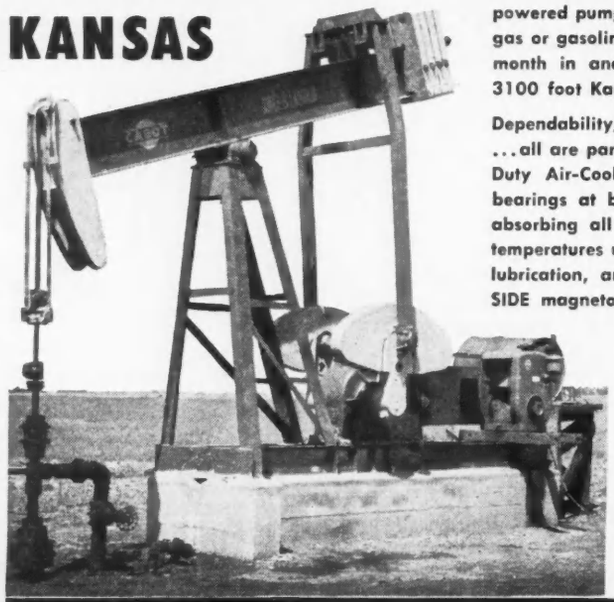


Large engines tied in to heavy-duty water flood pumps require large quantities of lubricating oil when a change of oil is necessary. A convenient tank for lubricating oil at one remote water injection station provides storage sufficient for several oil changes in the driving engine.

Two 55-gallon drums are welded together at their ends to form a long cylindrical vessel with a capacity of 110 gallons. This storage vessel is mounted on a rack supported by the steel beams of the station housing. The rack is well above both the pump and engine and about midway between them. The rack is constructed of sucker rod material welded in the shapes illustrated. Where the rods connect to the steel overhead beams, a flange plate is welded to the rod to form a web that is in turn welded to the beams.

At the bottom of one drum is a 1½-inch connection with a short extension of steel piping containing a control valve. The filling cap on top of the drums is visible at the near end. A neoprene rubber hose is attached to the discharge piping and a regular gasoline pump hand-controlled nozzle enables the pumper to carefully control the flow.

Work Days are 24 HOURS Long for this WISCONSIN-POWERED PUMP in KANSAS



Extra costs for "overtime" and "holidays" are "out" for this economical Wisconsin-powered pump operating on either butane gas or gasoline. It works 24 hours a day, month in and month out, pumping this 3100 foot Kansas well.

Dependability, efficiency, and economy ...all are part of every Wisconsin Heavy-Duty Air-Cooled Engine. Tapered roller bearings at both ends of the crankshaft absorbing all thrusts, air-cooling in all temperatures under all conditions, positive lubrication, and an easily-serviced OUTSIDE magneto with impulse coupling for quick, any-weather starting and running, add up to more service from your engine and less servicing to your engine. You get maximum dependability at minimum servicing expense.

4-cycle single-cylinder, 2-cylinder and V-type 4-cylinder models, 3 to 30 hp.

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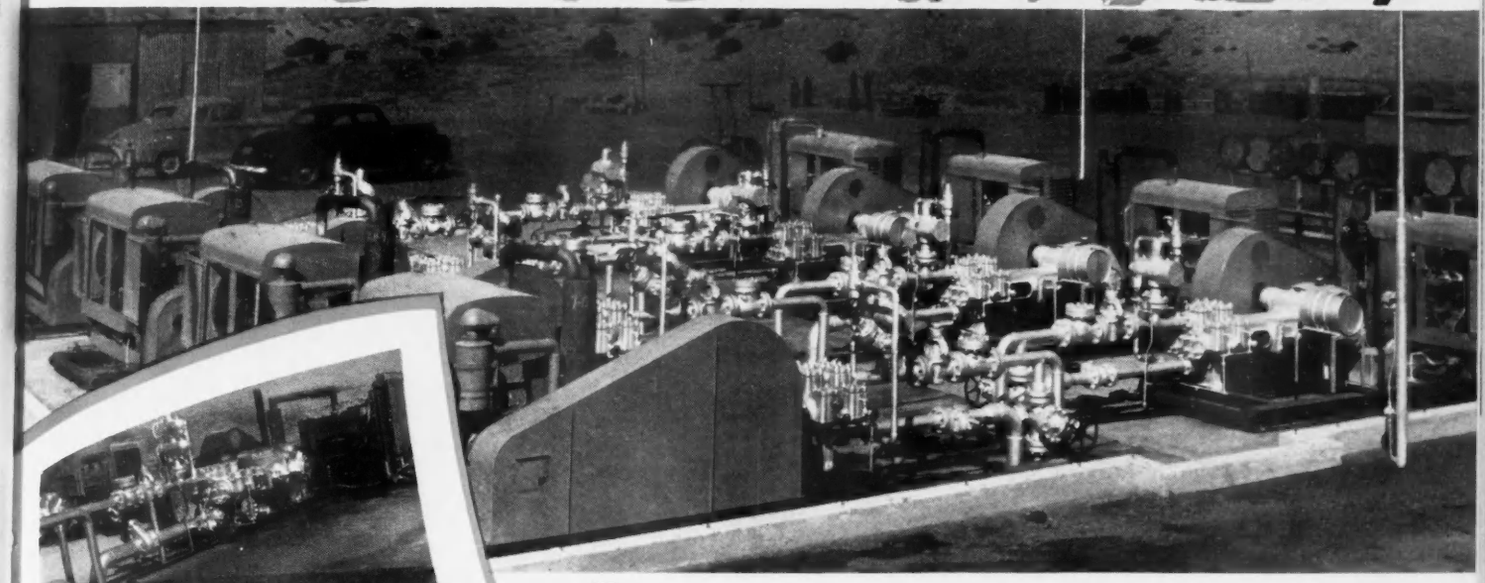
Pipe Line Section

DONALD M. TAYLOR, SECTION EDITOR

WORLD OIL

We help to feed RICHFIELD'S $7,000,000 "Baby"



BIG pipe lines like Richfield's, once laid, become fixed and permanent installations. It is the feeder lines that provide flexibility and expansibility, and that's where Gaso Pumps come into the picture.

They help to feed main lines by powering the auxiliary lines that reach out into tank farms, field storage and other source-points of oil.

Used singly or in batteries, Gaso Pumps are adaptable to any requirements. Their portability permits transfer when necessary to meet changed conditions. And their performance record assures the kind of service realistic pipe line engineers look for.

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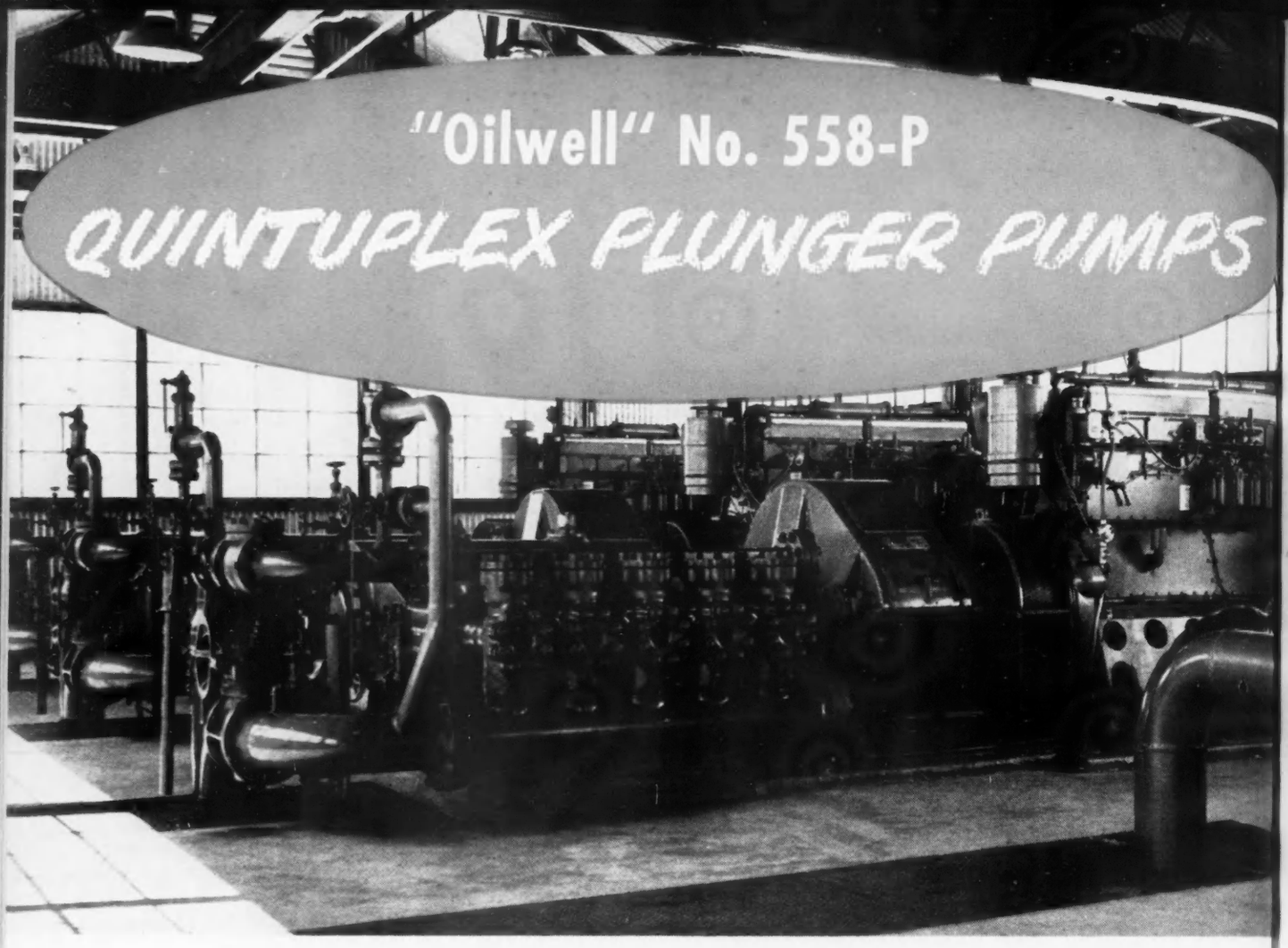
for every oil industry need



...PUMP HEAVY CRUDE

at Union Oil Company's Antelope Station near Avenal, California

THE PROBLEM confronting the pipe-line engineers of Union Oil Company in modernizing the company's Antelope Station and replacing the steam pumping equipment previously in service was:

1—**to pump 15-16 gravity crude oil through an 8-inch line in varying quantities to meet**

2—**flexible requirements which might vary from 9,600 to 25,920 barrels per day.**

THE SOLUTION was the installation of "Oilwell" No. 558-P heavy-duty quintuplex plunger pipe-line pumps, driven by diesel engines through suitable reduction gears. Each pump operates independently at 103-124 RPM ranges, to deliver from 450 to 540 Bbls/h of this heavy crude at 800 PSIG. The crude is heated to 180°F. before pumping. The installation consists of three pump-engine hook-ups, with two pumps operating and the third as a standby.

ASK YOUR "OILWELL" REPRESENTATIVE to show you how the design of these quintuplex pumps makes them exceptionally suitable for pumping either heavy or volatile products . . . and get your copy of the new "Oilwell" Pipe Line Pump Booklet—No. 13-51.

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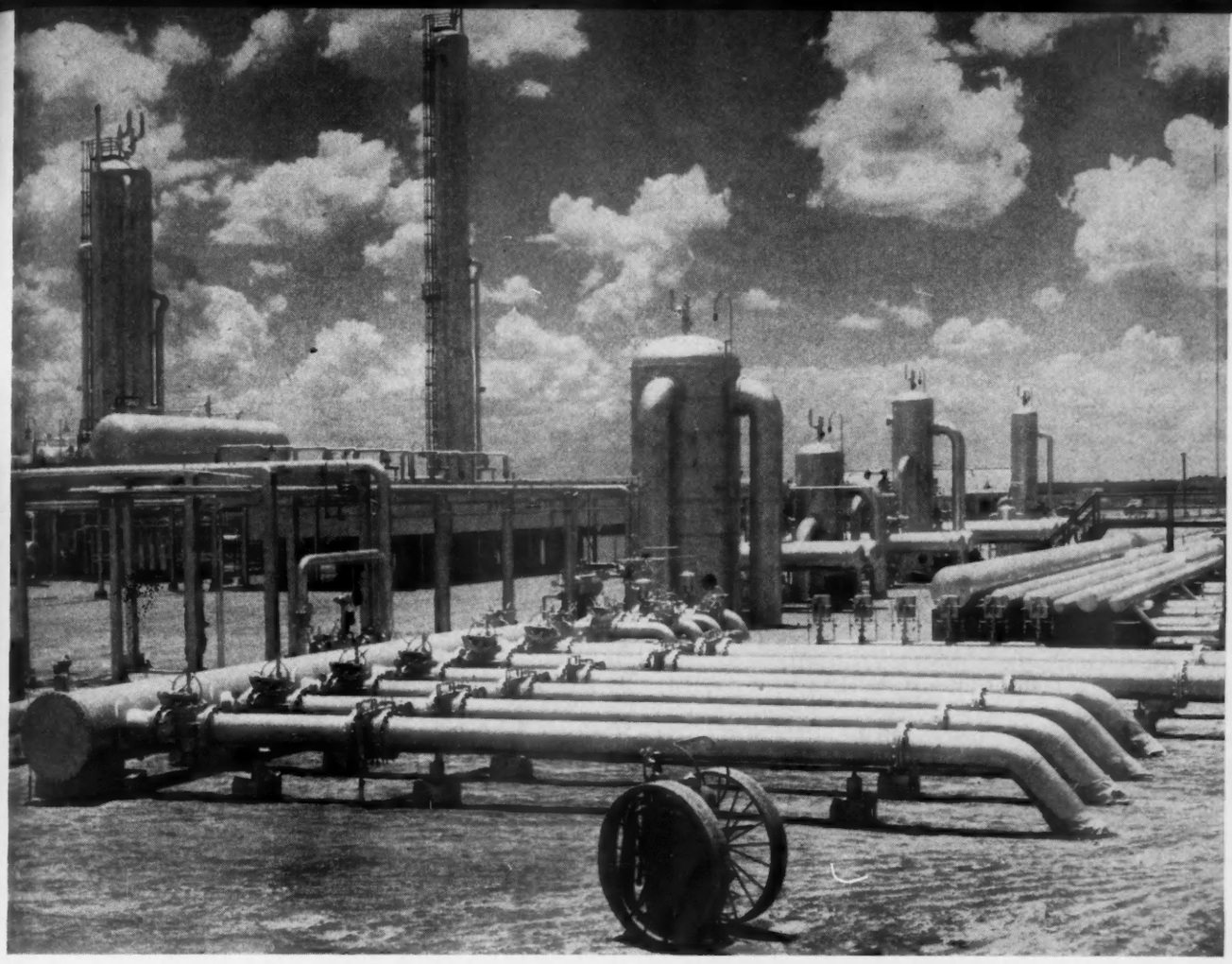


Photo by E. J. Mills

Snyder Gasoline Plant manifold on the low-pressure gas gathering system. Gas metering installations are made on each eight-inch gathering line.

Gas Gathering Facilities of the Snyder Gasoline Plant

By HAROLD G. TEVERBAUGH
Sunray Oil Corporation, Tulsa

TWO complete and separate systems, one designated as the high-pressure and the other the low-pressure, compose the Snyder Gasoline Plant's gathering facilities, operated by Sunray Oil Corporation, for about 90 operators and other owners. These systems gather casinghead gas from 840 wells on 34,350 productive acres in the Canyon Reef lime in the Kelly-Snyder field. Unusual features incorporated in the design of these facilities include interstage heating between the gas separators on the individual leases, and an automatic drip collection system operating as an integral part of the low pressure system.

During the initial discussions on construction of a gasoline plant in the area, it was determined that a design combining a high- and a low-pressure gathering system would be the most economical due to the reduced plant compressor horsepower requirements. The various operators decided to install the high-pressure system as soon as possible in order to conserve about 40 percent of the flare gas during the construction of

ENGINEERING HIGHLIGHTS of an efficient and unique gas gathering project are presented. Actually, there are two separate and distinct systems described, for the conditions for each line are quite far apart. This project is part of the large gas conservation project in the Kelly-Snyder fields where approximately 4 billion cubic feet of casinghead gas has been conserved during the first year of operation.

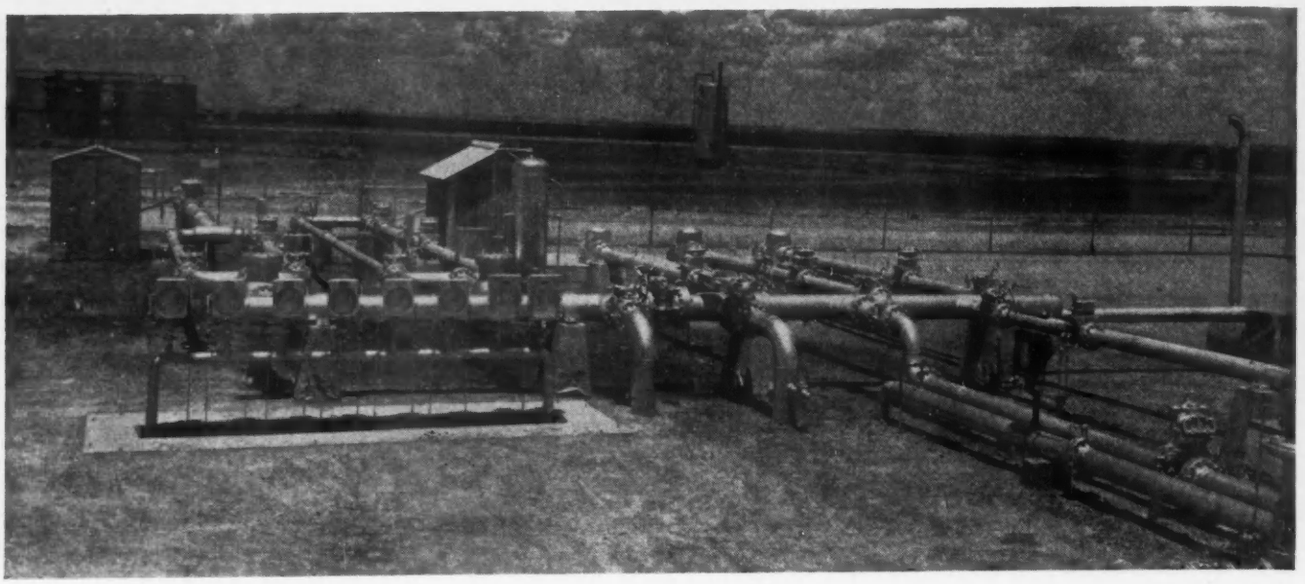
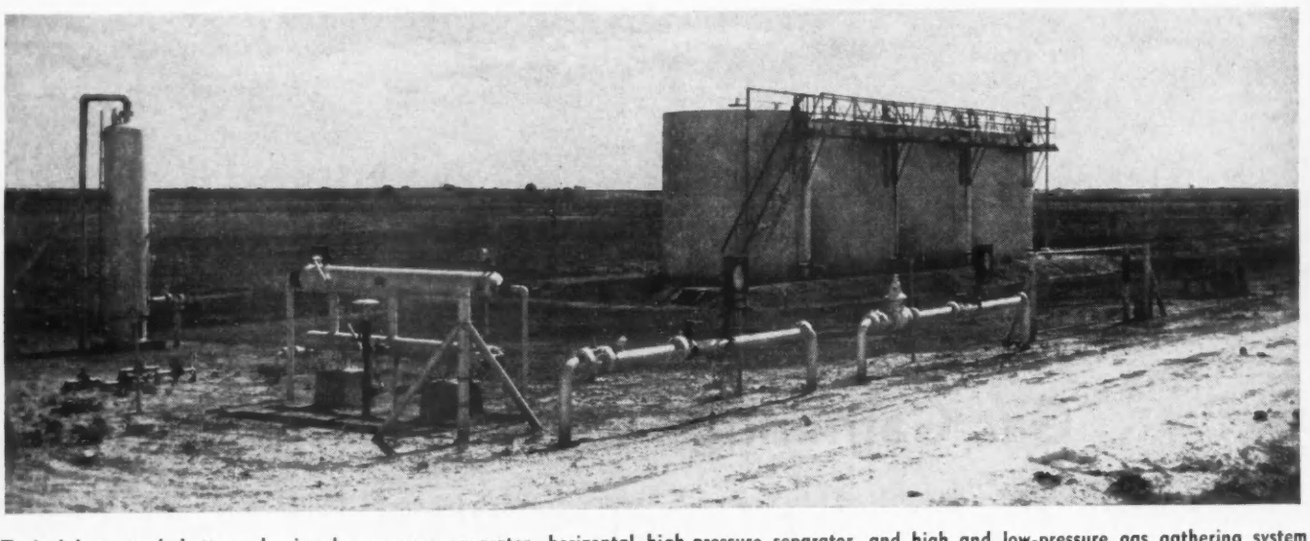
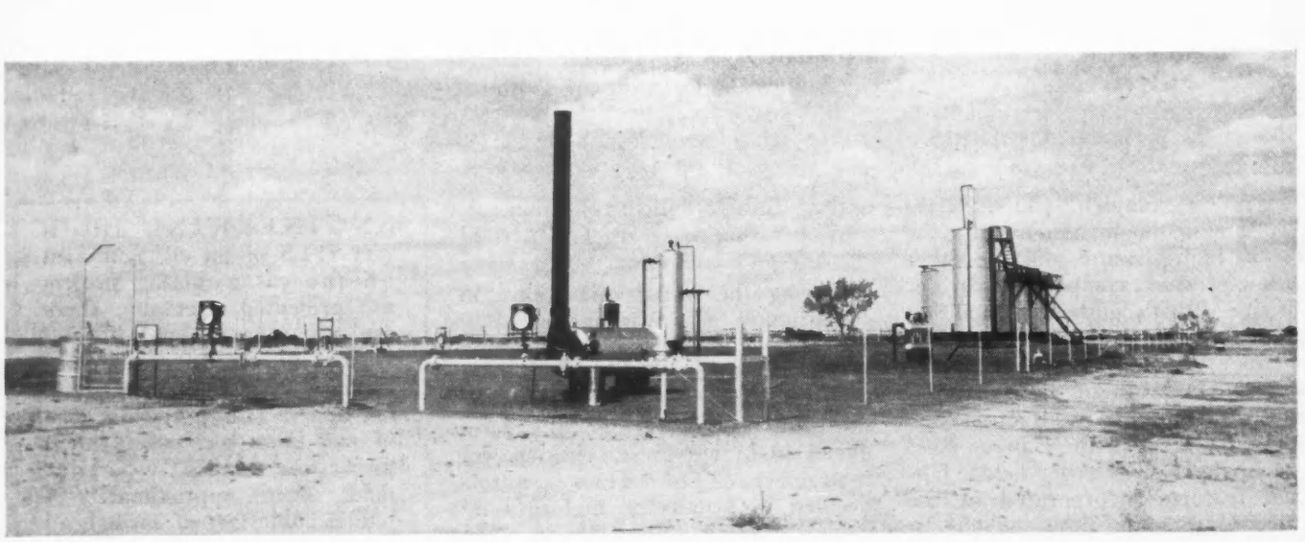


Photo by E. J. Mills

Over-all view of the high-pressure manifold at the plant site showing metering facilities at left.



Typical lease tank battery showing low-pressure separator, horizontal high-pressure separator, and high and low-pressure gas gathering system meter runs.



Typical lease tank battery showing installation of indirect-fired heater for interstage heating between high-pressure (right) and low-pressure (behind heater) separators.

the plant. This made it necessary to design a system which would operate under two conditions, namely 400 pounds per square inch gauge during the period of delivering gas for sale prior to plant operation and 200 psig when gas could be produced into the suction of the third stage of compression when the plant was completed. Since the second condition involved the largest volume, it was used as the basis for design and set up as follows:

Allowable per well .....84 bpd
Gas-oil ratio .....725 cf/b
Separator pressure .....200 psig.
Pressure drop between separator and plant .....50 psig.
Flowing temperature of gas .....70°F.
Specify gravity of gas.....0.8225
Supercompressibility 9.945
Maximum design working pressure .....575 psig.

No design safety factor was used since the above conditions would result in a safety factor of about 1.5 during the first phase of operation.

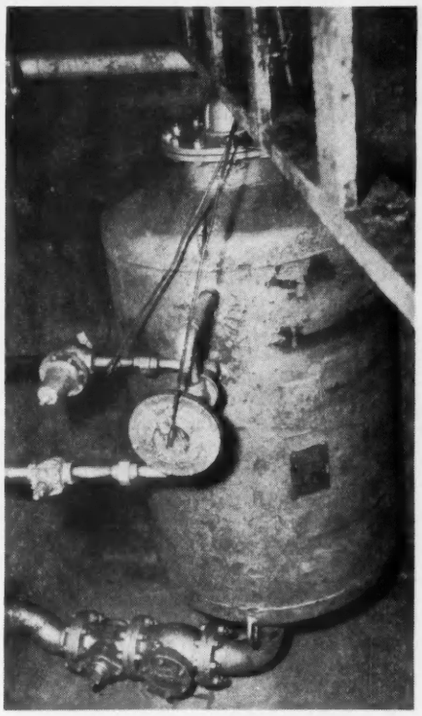
Pressure drop and line size computations were made using the Weymouth Gas Flow formula corrected for the supercompressibility of the gas. Under the above conditions this formula was used in the following form:

$$P_1^2 - P^2 = \frac{Q^2 L}{57.56 \times 10^4 \times d^{5.334}}$$

P_1 is the initial pressure, P_2 the final pressure, Q is rate of flow in standard cubic feet per day, L is length in miles, and d is the internal diameter of the pipe in inches. The system as designed included three 8-inch and one 6-inch main lines into the plant. Design capacity of the system is approximately 50 million cubic feet per day through a network of 100 miles of 2-, 3-, 4-, 6- and 8-inch pipe.

Construction of the high-pressure system was started in April, 1950. All pipe was coated with a primer coat and a 3/32-inch coating of pipe line enamel reinforced with glass fiber wrap. A kraft paper wrap was applied to protect the coating during laying operations. Lease tie-ins and metering facilities were of the conventional type. Connections to the separators were made through valves furnished by the operators, then combination check and back-pressure valves were installed just ahead of the gas metering facilities. In this system, more than 160 meter runs and meters were installed to measure gas from the individual leases.

Initial operation of this system was started in July, 1950, approximately a year prior to the completion of the plant. Approximately 4 billion cubic feet of field gas was conserved during this initial 12 months of operation.



Vertical view of drip blow case installation showing liquid line to the blow case at upper right, liquid line discharge at lower right. Three-way valve is shown on top with high-pressure gas line below vent line above.

Low-Pressure System

Design of the low-pressure gathering system was based on the following conditions:

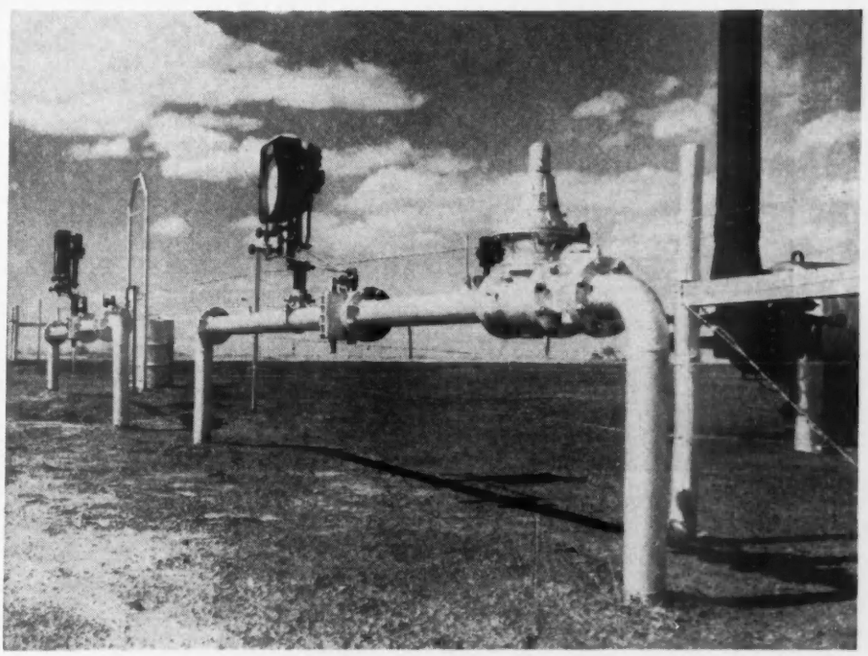
840 wells on 40-acre spacing.
93.75 Mcf per well per day.
15 psig field separator pressure.
0 psig plant intake pressure.
90° F. flowing temperature of gas.
1.300 specific gravity of gas.
Lateral line size increased one nominal size over that computed for the above conditions.

Weymouth's Gas Flow formula was also used in the design of this system. Based on the above design conditions, the low-pressure system has the capacity to deliver 100 million cubic feet of gas per day to the plant. This system required approximately 120 miles of pipe satrting with 30-inch adjacent to the plant down to four-inch serving the 260 individual leases. The lateral line sizes were increased one nominal size to make it possible to expand the capacity of the system to 150 million cubic feet per day by merely looping portions of the main gathering lines.

Construction of the low-pressure system was started in October, 1950. All pipe was coated and wrapped in the same manner as the pipe for the high-pressure system. Lease tie-ins and metering facilities were installed similar to the high-pressure system except that the back-pressure regulator was installed downstream of the meter run and the check valve was omitted. Block valves were installed where the lateral lines join the main line and at strategic locations along the main lines to make it possible to repair a section of the system without shutting in an entire main line. This system was completed and placed in operation during June, 1951.

Drip Collection System

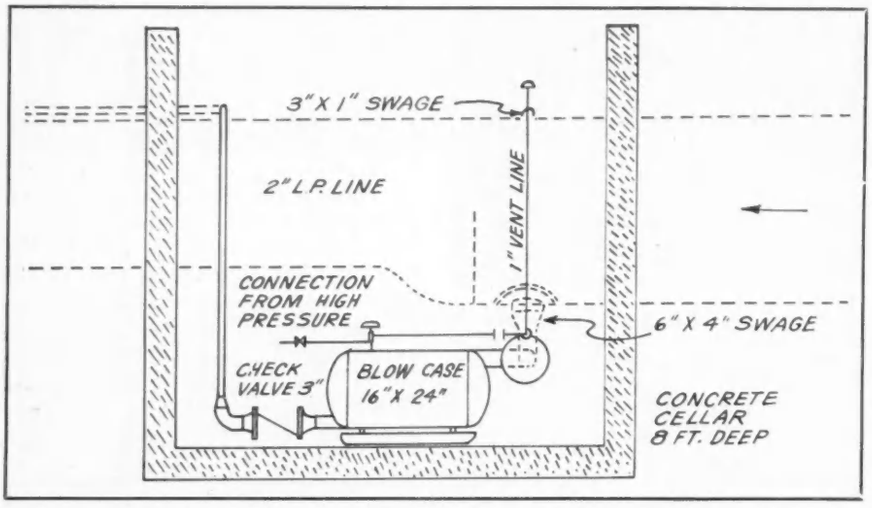
Due to the extreme richness of the low-pressure gas, it was considered



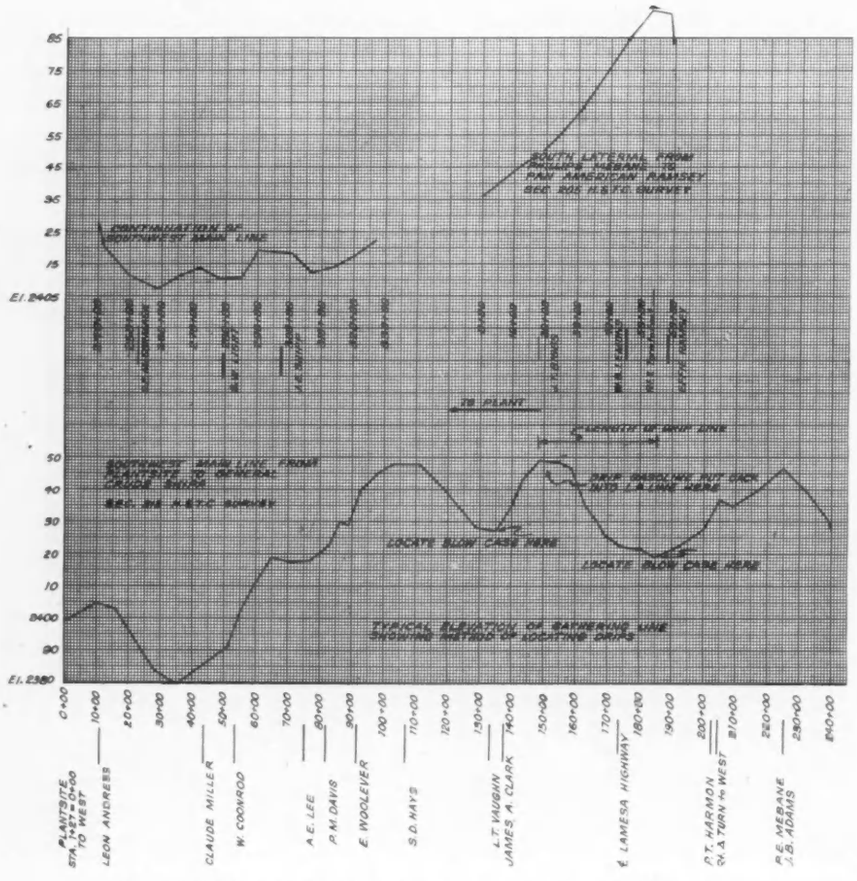
Typical installation of high-pressure (left) and low-pressure metering facilities at each lease.

necessary to design a drip collection system to remove the condensate or drip gasoline as it accumulated in the gathering lines. From a study of a survey of the elevations of the gathering system rights-of-way, it was found that 57 low points scattered throughout the system would require drips. To remove the drip gasoline by conventional methods such as a complete drip gathering system paralleling the low-pressure line would require high investment and operating costs. Therefore, a system was designed whereby the drip gasoline could be transported through the low-pressure gathering lines to the plant.

Installation of slowup joints at a low point in the line to which specially designed blow cases were connected fulfilled this requirement. As liquid accumulated in the slowup joint, it would flow into a four-inch line through a check valve and into the blow case. The liquid flow into the blow case causes the sensitive float to rise. At a pre-determined level the float trips a pilot control which trips a three-way valve allowing gas from the high-pressure system, which parallels the low-pressure system, to pressure the drip gasoline to the top of the next hill through a separate drip line. At this point the drip gasoline is put back into the low-pressure system where it flows by gravity into the next drip blow case at the next low point in the low-pressure system.



Elevation sketch of piping and equipment layout for blow case installation.



Typical elevation of gathering line, showing method of locating drips.

As the level in the blow case falls, the pilot control closes, the three-way valve is reversed, and the gas under pressure is vented into the low-pressure system. This procedure is followed at each successive drip until the liquid reaches the drip installed just before the plant intake header. The blow case at this point pressures the drip gasoline into a storage tank.

Pits required for the installation of the drip blow cases are 5 feet wide, 7 feet long, and 8 feet deep, and the walls and floor are lined with reinforced concrete. Slots 12 inches long were formed in the concrete walls to provide for installation of the piping with enough room for movement of the piping in case of contraction or expansion of the gas gathering lines.

This system required about 23 miles of two- and three-inch pipe as compared to 70 miles of pipe required for a separate drip collection system. From an operating standpoint, this system is completely automatic. Had the drip truck method been used, it would have required at least two truck crews to collect the drip gasoline.

Operation of the drip collection system was started in June, 1951, and few operating troubles have been experienced.

Interstage Heating

Installation of the high-pressure gathering system required that serious consideration be given to the problem of freeze-ups and paraffin deposits in the crude lines due to the low temperatures resulting from the flashing of the crude through the high-pressure separator dump valve. Also of major importance was the problem of flashing enough of the casinghead gas at the resulting low temperature in the separator to prevent excessive stock tank vapor losses.

Numerous field tests were run to determine the solution to this problem, and it was found that a heater would be required between the high-

Pipeline on the March

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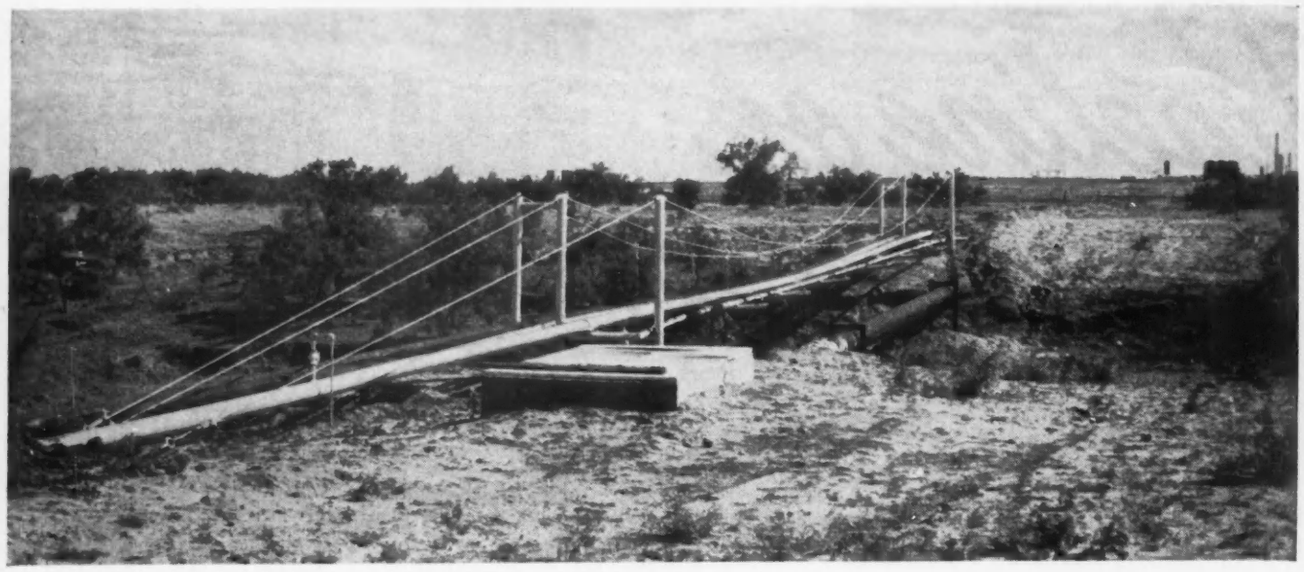


Creek crossing for high-pressure gas gathering line and products loading line. Note drip blow case cellar in the foreground.

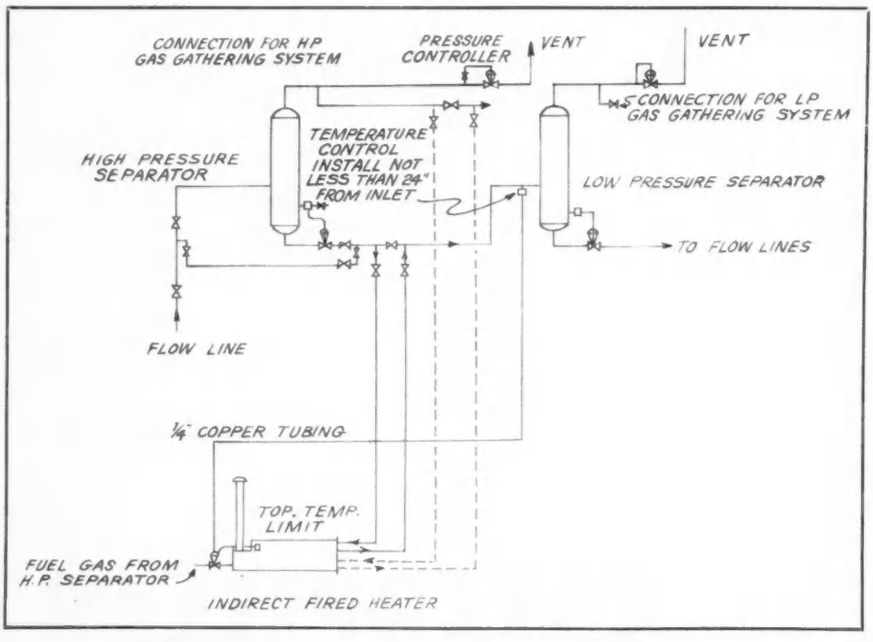
pressure and low-pressure separators on the individual leases. These heaters prevented the formation of paraffin deposits in the crude lines between stages of separation and between the low-pressure separators and the storage tanks. The increased temperature in the low pressure separator allows operation of these separators at 15 psig with the release of an amount of casinghead gas equivalent to that obtained from the conventional design of elevated low-pressure separators operated at atmospheric pressure.

As a result of these heater-separator field tests, a hearing was held before the Texas Railroad Commission on March 23, 1950, whereby the commission informally approved use of two-stage gas separation in the Kelly-Snyder Field Gasoline Plant area, and interstage heating between the gas separators on the individual leases.

Since it was possible to operate the low-pressure separators at 15 psig instead of the conventional 0 to 5 psig separator pressure, a substantial reduction in the size and tonnage of pipe required for the low-pressure gathering system was possible. Also, this higher separator pressure reduced the plant compressor horsepower requirements by about 2000 horsepower.

Other advantages resulting from interstage heating between separators include: (1) Lease owners would not have to elevate their separators to obtain the maximum amount of flashed gas from the oil; (2) prevents climatic changes from affecting the gasoline content of the gas coming from the individual leases; and (3) reduces stock tank vapor losses.

Another important advantage resulting from the installation of these heaters was realized during the past winter's operation. By making several minor revisions in the heater hookup, it was possible to use two of the heater coils to heat the gas from the high-pressure separators, thereby reducing hydrate formation in the high-pressure meter runs and gathering lines.



Flow diagram for typical lease hookup in the Kelly-Snyder field.

☆

About the Author

HAROLD G. TEVERBAUGH, process engineer, Gas-Gasoline department, Sunray Oil Corporation, Tulsa, was graduated from Oklahoma A. & M. College, Stillwater, in 1947 with a degree in chemical engineering. He attended high school in Ponca City and was formerly associated with Stanolind Oil & Gas Company.

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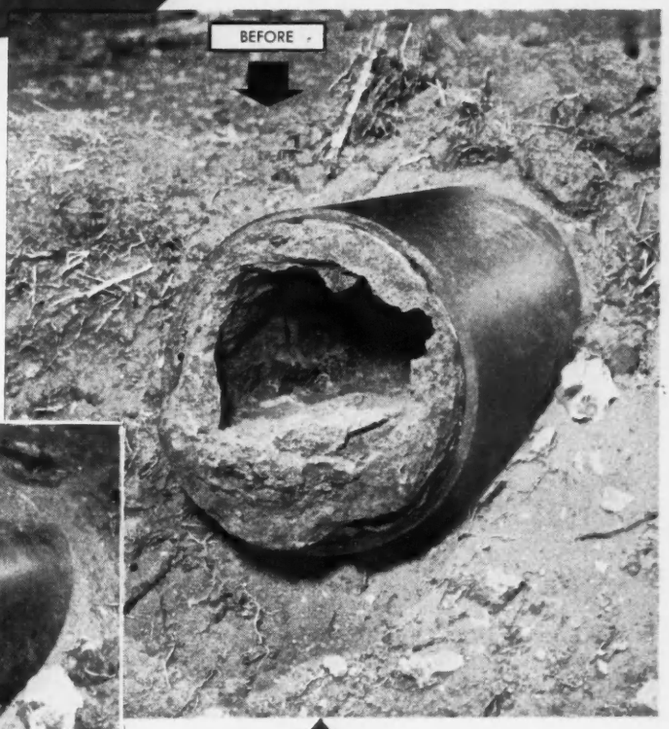

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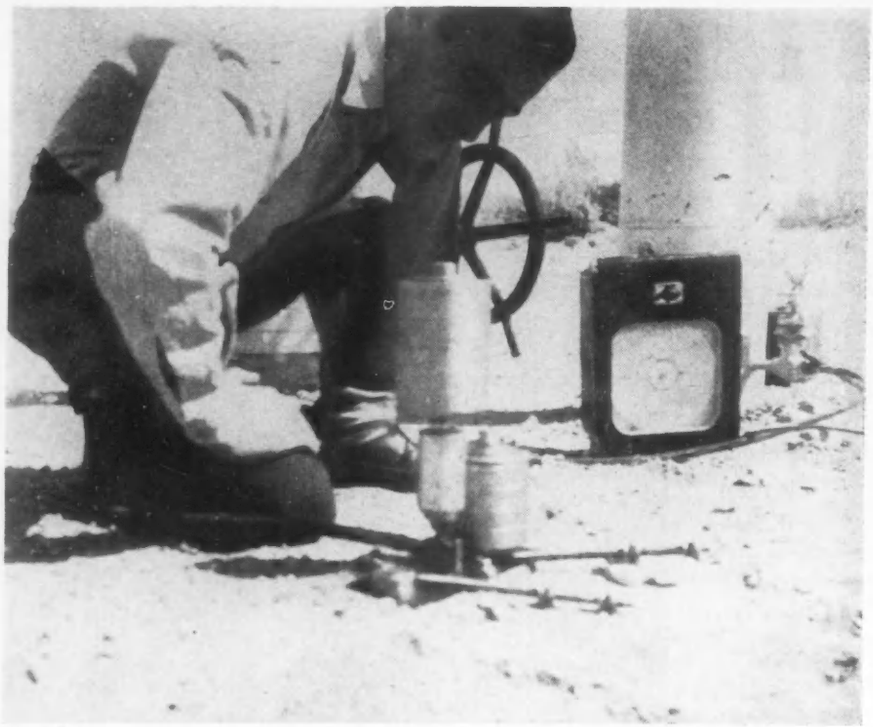


Taking a deadweight pressure reading in the field. Riser and temperature recorder are visible in the background.

Pipe Line Flow Efficiencies

BECAUSE GAS transmission company earnings are directly related to pipe line flow efficiency, most companies in the industry are vitally interested in the subject today. El Paso Natural Gas Company engineers have made great strides in obtaining information on this important phase of operations, and have greatly increased their own pipe line flow efficiencies.

By CLINTON McCLURE
Engineer, El Paso Natural Gas Company

THE problem of maintaining high flow efficiencies usually arises after the pipe line has been been in service for several years. The El Paso Natural Gas Company's flow efficiency studies have been accelerated by the rapid collection of foreign materials in the pipe line. The majority of recent expenditures for pipe line cleaning (pigging) have been to remove the rapidly accumulated contamination.

Rapid contamination of the company's pipe lines arises largely from treating plant fluids. A high percentage of the gas transported through the lines is a product of residue gas, which is treated with glycol and amine. In this process a considerable amount of each fluid is lost to the gas stream through malfunctions of different parts of the plant. Lubricating oils from gas compressors are also carried into the gas stream. These oils drop out in the pipe line as a result of motion or pressure and temperature conditions.

The revenue of a natural gas transmission company depends upon the company's ability to deliver the amount of gas specified in the contract with the customer. Failure of the company to comply with the contract may be due to low pipe line flow efficiencies. Therefore, it becomes mandatory that frequent periodic flow checks be made on the line. These checks provide the proper information for the determination of the amount of pigging to be done.

El Paso Natural created its own flow efficiency unit in February, 1948, to obtain more information on actual flow conditions. This unit was placed under the direction of the chief gas dispatcher for close coordination with the dispatching unit.

The dispatching unit depends upon the flow efficiency unit to locate a restriction indicated by dispatching data and to determine the extent of contamination. Data are obtained by this unit previous to and following the pigging of any section of line. From this data it is possible to determine the most efficient method of pigging. Two years of flow efficiency tests on the company's lines have determined the frequency of routine checks for each bracket of line, except for accidental contamination. When this happens, the dispatching unit relays the information to the flow efficiency unit for consideration. Each time a bracket of line is checked, a report is sent to the transmission superintendent, who utilizes the information in the pigging program for the following year. Copies of the line efficiency reports are also forwarded to the engineering department for a check of design versus operating conditions.

The flow efficiency unit consists of one field man plus an assistant and one man to calculate flow efficiencies from data obtained. Two of the men are qualified to work in the field or office. This unit obtains assistance from district maintenance personnel when necessary.

To obtain accurate flow efficiency data the proper instruments, transportation, and a simple, convenient method of communication are necessary.

The pressures are obtained with 0-1000-pound deadweight pressure

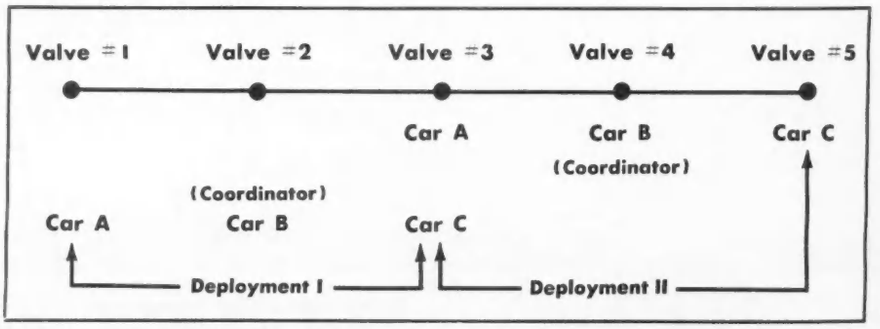


FIGURE 1. Schematic chart showing manner in which radio-equipped cars are deployed to the several valve locations along a particular section of line under test. Deadweight testers are connected upon arrival at each point and pressures are taken at ten-minute intervals to determine when conditions are suitable for flow tests. Upon finding favorable pressure variations, deadweights are read at synchronized watch times to obtain flow data. The three vehicles then are moved to the next deployment.

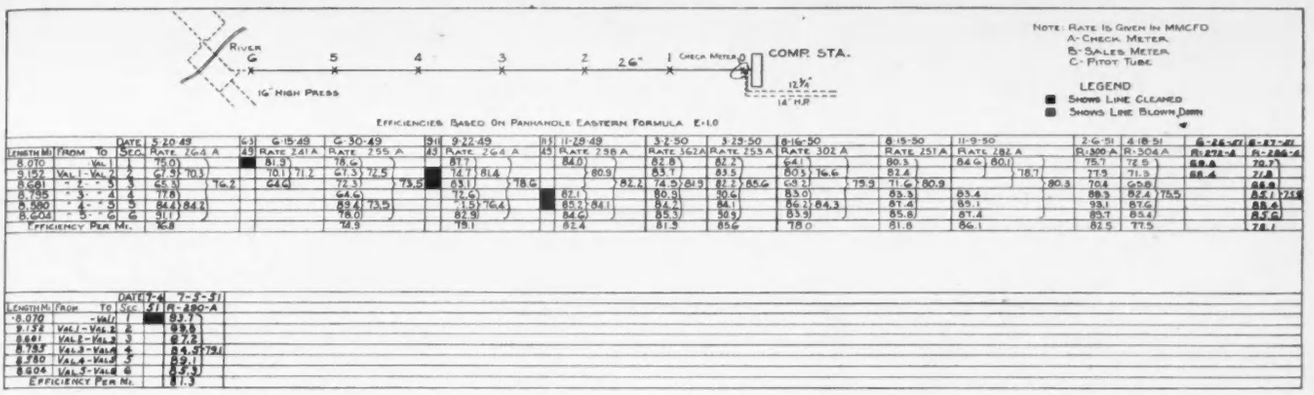


FIGURE 2. Tabulated record of cleaning operations on a section of 26-inch line. No detergent was used in operations shown on cleaning dates 6-3-49, 9-11-49 and 11-5-49 and maximum efficiency recovery was 10.8 percent. In cleaning date 7-5-51, new pipe flow efficiency, or possibly better than new pipe flow efficiency was attained by using 2.5 pounds of detergent per 100 gallons of water and 493 feet of water wall contact.

gauges. The accuracy of these deadweights has been checked to within one inch of water differential equivalent at 800 pounds pressure. Although these gauges are extremely sensitive, identical pressures taken with two or more of them will indicate a different pressure of as much as 1½ pounds. As a result of this, it becomes necessary before or after each flow efficiency test to determine the indicated pressure relationship of the deadweights used. An aneroid barometer is available to obtain the barometric pressure at each pressure point. The first method used to obtain pressures for flow efficiency data was 0-1000-pound pressure recorders. The average pressure for a day's time was used in flow calculations. Use of these instruments required less manpower, but their accuracy is not dependable. The pressure recorders are still valuable instruments in obtaining pressures that fluctuate as much as one pound per minute.

The flowing gas temperatures are taken with a dependable temperature recorder having extended capillary tubing and temperature bulb. The soil is removed from above the pipe line wherever flowing temperature is desired and the temperature bulb is placed flat on the exterior pipe wall. The bulb is then covered with one to two inches of powdered asbestos and

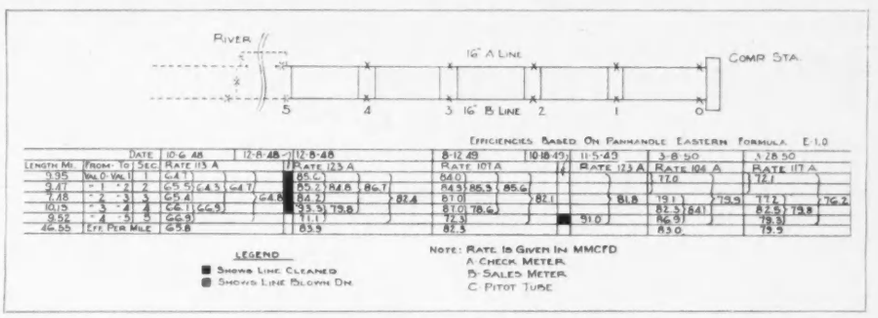


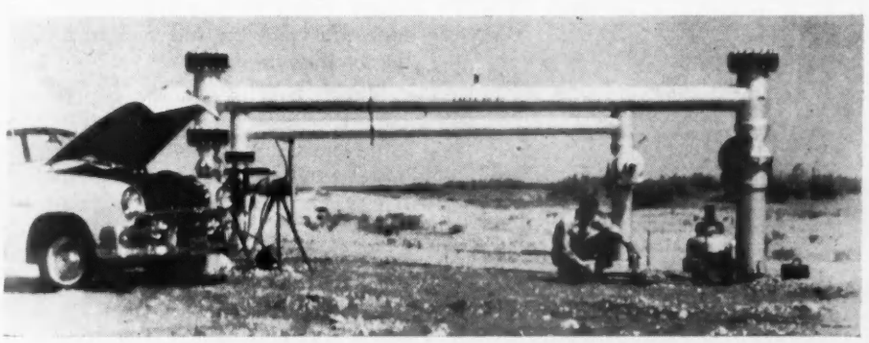
FIGURE 3. Tabulated record of cleaning and test operations on section of 16-inch line. No detergent was used and 500 feet of water-wall contact was used in sections 1, 2 and 3 in cleaning date 12-8-48.

this in turn is covered with two or three layers of heavy paper. Six inches to one foot of soil removed from directly above the pipe is then replaced on top of the paper. One to two hours are required for the temperature to stabilize at the pipe temperature. The accuracy of this method to within one degree Fahrenheit has been checked with the use of a specially made temperature bulb from a temperature recorder. This bulb is projected directly into the gas stream through a one-half-inch gate valve at pressures as high as 830 pounds per square inch gauge. The bulb has a four-inch sensitive element with an eight-inch steel extension tubing of the element diameter. A shop-fabricated packing gland threaded at the bottom for the one-half-inch valve and threaded at the top for fastening the temperature bulb down, prevents gas escape while placing the element in the line or after positioning it.

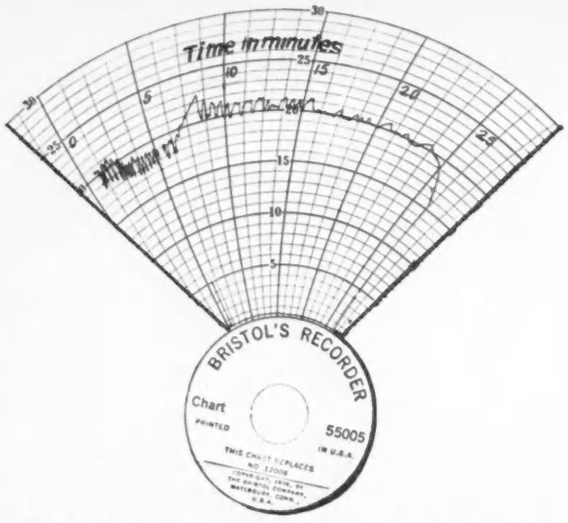
Insufficient data on flowing temperature have caused several errors in pipe line design for many companies. For small lines, a design error in temperature will not result in serious circumstances. If the line or lines carry up to 1 billion cubic feet per day, an error of eight degrees Fahrenheit will either increase or decrease the flow approximately 10 million cubic feet per day from design conditions. If the flowing temperature has been underestimated, it may mean that another engine or more line will be required to meet previous design flow. If a line in operation fails to meet design conditions, flowing temperatures should be one of the first items checked.

Specific gravity of the flowing gas may be as detrimental to gas sales as flowing temperature. Specific gravity is easier to determine at less expense than temperature measurements. Gravitometers placed at several locations on the company pipe line facilitate dependable gravity measurement. Wherever these instruments are not available for gravity data, the flow efficiency unit uses a gravity balance.

Accurate measurement of gas flow in the company's line at any location has been the major problem in obtaining flow efficiency data. To



Line crossover arrangement showing operations connected with taking pressures, temperature and specific gravity of gas. Suction for gravity balance is being supplied by connection to vehicle carburetor.



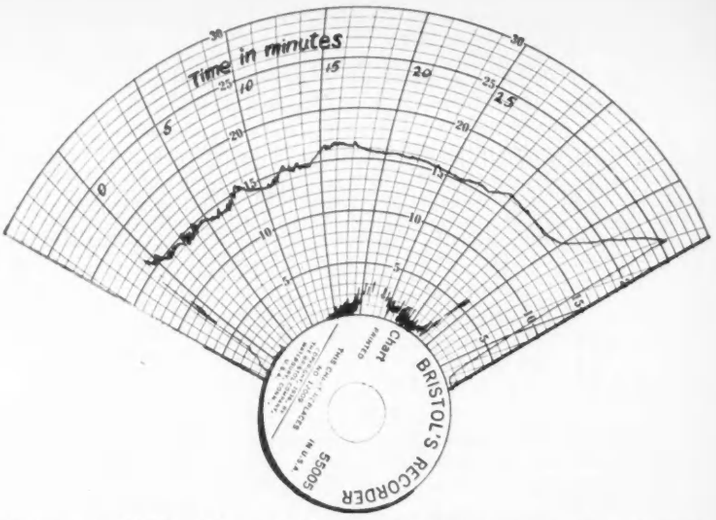


FIGURE 4 (left). Record obtained of pressure behind pigs used on pigging date 7-5-51 of Figure 2. Water and detergent were used at this time. Average velocity of the pigs in this case was 17.3 miles per hour. Line contamination caused irregular pressure record.

FIGURE 5 (right). Record obtained of pressure when same line was rinsed. Large pressure increase at end of period was caused by pigs becoming lodged in 45-degree ell, the latter used to divert water and pigs outside and to one side of the bell hole.

place an orifice meter every 50 to 100 miles on the main line would be too expensive for the purpose it would serve. The flow efficiency unit has developed a portable pitot tube that is serving as a dependable method of measurement. If care is exercised in the use of this tube, an accuracy of 2 percent can be expected.

A variation of the Panhandle Eastern flow equation is used by this company in calculations of flow efficiencies. In order to clarify the list of measurements required to calculate theoretical flow, this flow equation is as follows:

$$Q_t = \left(\frac{P_1^2 - P_2^2}{L}\right)^{.5394} K \times F_t \times F_g \times F_{pv}$$

Q_t = Theoretical flow in million cubic ft. per 24 hrs. based on .600 gravity, 60° F., and 14.9#

P_1 = Upstream absolute pressure lbs./in^2

P_2 = Downstream absolute pressure lbs./in^2

P_1 or P_2 corrected for elevation difference by $\frac{P_1 + P_2}{2} \times .0000253 \times$ difference in elevation in feet

$K = .000879 \times d^{2.0182} \times E$ where d = inside diameter in inches and E = an experience factor = 1.0

F_t = Temperature correction

F_g = Gravity correction

F_{pv} = Boyle's law deviation factor

L = Length between point P_1 and point P_2

Using E = 1, the maximum efficiency obtained should be 92 percent. This is known to be slightly in error because of variation in pipe roughness. An example of this is shown in Figure 1. After Section 1 was cleaned, the efficiency was calculated to be 93.73 percent. Other accurate tests have indicated that E is greater than 1 to obtain a maximum efficiency of 92 percent.

$\frac{Q_m}{Q_t}$ = Efficiency of flow

Q_m = Metered flow

A radio equipped vehicle is used at each pressure point during the flow efficiency test. If only three vehicles and deadweights are available, vehicles are deployed as shown in Fig. 1.

If a series of 11 pressure points is desired, each vehicle is required to move five times. If communication with the dispatching unit is available, frequent progress reports are made. Previous data and calculations have determined the maximum pressure fluctuation of two pounds per hour cannot be exceeded for consistent efficiencies. Upon arrival at Valves 1, 2, and 3, (Figure 1) pressures have been leveled off by order of the dispatching unit. Deadweights are connected upon arrival at each point and pressures are taken at ten-minute intervals to determine whether or not the conditions for the tests are suitable. Pressure progress at Valves 1 and 3 is reported to the coordinator at Valve 2 by means of radio communication. Upon finding favorable pressure variations, deadweights are read at synchronized watch times to obtain flow data. The three vehicles are then moved to deployment No. 2. This method of shifting is continued until all the line desired is checked. By having car A shift to car B's former position, a check of pressure change, if any, can be made. Telephone communications are available between all compressor stations. Thus, if each section between stations is checked, an over-all check can be made to verify whether or not the average efficiency per section equals the efficiency from station to station.

The four important items in pigging a natural gas pipe line are detergent-water ratio, proper water-wall contact, pig velocity, and type and number of pigs used.

There has been some controversy over the use of a detergent in pipe line cleaning. Clear water will remove a large part of the fouling in the line where grease or oil is not present. Oil exists in all of the company's pipe lines where the lines have been in service for some time. Therefore, in order to be sure of obtaining the most efficiency improvement in pipe line cleaning, it becomes necessary to use a detergent. The type of detergent used depends on its chemical reac-

View of equipment used in pigging a 26-inch line with 13,000 gallons of water. In center foreground is tank in which water and detergent are mixed.

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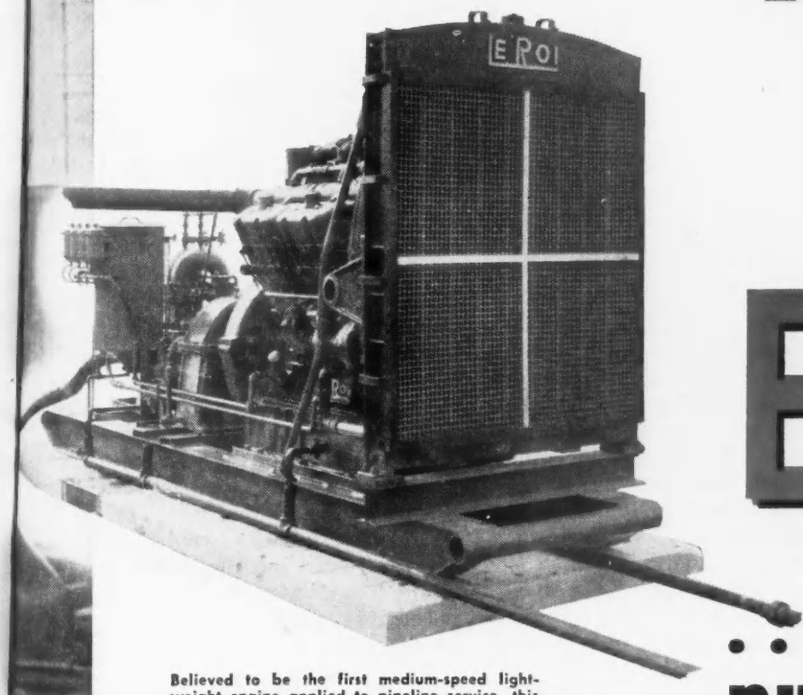

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tion with the water to be used. Varying amounts of detergent per 100 gallons of water have been tried. The relative cost of the detergent to that of cleaning a section of line is small. For the best results obtained thus far, 2.5 pounds of detergent per 100 gallons of water were used. The full amount of detergent used was mixed with 3000 gallons of water in an open tank and 10,000 gallons of clear water added in the pipe line.

Insufficient water-wall contact when pigging large lines (26 and 30-inch) reduced the cleaning effect during the early days of pigging operations.

Referring to Figure 2 and cleaning dates 6-3-49, 9-11-49, and 11-5-49, the maximum efficiency recovery was 10.8 percent. The water-wall contact for these operations was approximately 190 feet. No detergent was used in these operations.

Upon examination of Figure 3, cleaning date 12-8-48, Sections 1, 2, and 3, 500 feet of water-wall contact was used. No detergent was used in this case. The difference, approximately 9 percent gain, indicates the difference obtained by using 310 feet more of water-wall contact. Again referring to Figure 2, cleaning date 7-5-51, new pipe flow efficiency or possibly better than new pipe flow efficiency was attained by using 2.5 pounds of detergent per 100 gallons of water and 493 feet of water-wall contact. This line contained a mixture of glycol, amine, oil, water, iron sulfide, and sand.

The effect of the velocity of the pig has not been determined. It can safely be assumed, however, that more contact with the pipe interior is made by a slow velocity pig. Another point to consider is the soaking effect of the water and soap ahead of the pig. Water ahead of a pig traveling at high velocity does nothing more than touch the wall of the pipe with very little penetration of the contaminating material. A safe rule to follow on pig velocity is to apply enough pressure behind the pig to assure movement but only low velocities. Chances of the pig becoming stopped by obstructions in the line are greater at low velocities but more pressure may be applied if this happens. A pressure indicator or recorder should be used to determine pressure behind the pig. The pressure will rise at a rapid rate until the pig begins to move. If too much gas is applied, the pressure will continue to rise. The gas should be cut back as the pig begins to move to a point where it becomes stabilized except for minor fluctuations due to elevation changes or more severe line contamination. This method assures a minimum velocity above the stopping point of the pig.

Figure 4 shows the pressure record behind the pigs used on pigging date 7-5-51 of Figure 2. The average velocity of the pigs in this case was 17.3 miles per hour. Figure 4 was obtained from the water-detergent pigging of that date. Figure 5 was obtained from rinsing the same line. Comparing Figures 4 and 5, the effect of the line contamination in Figure 4 caused the pressure to be more irregular than in Figure 5. The large increase in pressure during the final minutes of Figure 5 was caused by the pigs becoming lodged in a 45-degree ell. This ell was used to divert the pigs and water to the side of the bell-hole.

Three pigs, consisting of a plow, wire bristle pig, and a swab, were run with water-detergent solution on test date 7-5-51. The rinse solution of clear water was forced through the line by two bristle pigs and a swab. The important item in selecting a bristle pig is its ability to buff the inner surface of the line. Too much length on the bristles will cause them to bend and no longer make contact with the surface of the pipe. The plow ahead of the bristle pig will keep large foreign objects from getting into the bristles of the trailing pig. The swab should have sufficient rubber rings to carry all water out the discharge end of the line. Water recovery is as important as cleaning the line. Water collection in low spots forms a restriction equivalent to any other liquid deposited there.

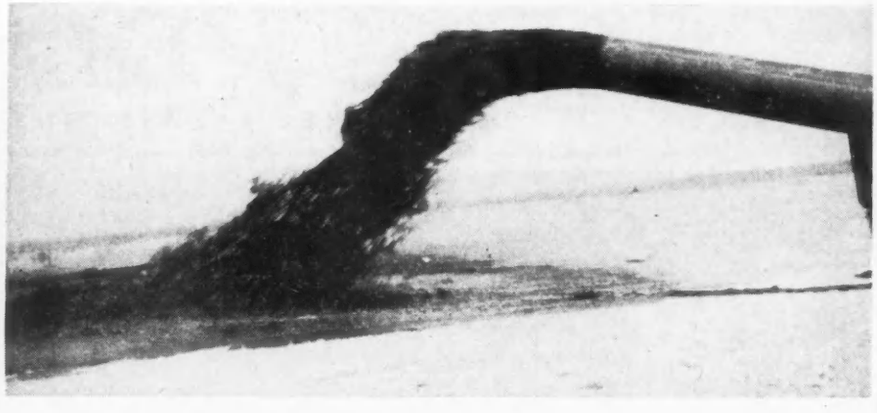
Additional pressure drop in pipe line gas flow exists if oil in a mist or vapor form is carried into the gas stream. This amount of pressure drop can be calculated if the quantity of oil flowing is known. It is hoped that a method for determining this can be perfected in the near future.

Improvement in the methods of obtaining flow data has eliminated large variations previously occurring in flow efficiencies. With extensive research and exchange of information among natural gas transmission companies, the evaluation of pipe line flow efficiencies resulting in lost revenue may be made.

About the Author

CLINTON McCLURE was graduated from New Mexico A & M College in 1949 with a Bachelor of Science degree in mechanical engineering. Joining El Paso Natural Gas Company, he was for eight months junior project engineer. He then was promoted to the position of main line efficiency flow checks engineer, a position he has held for the past 18 months. He is a junior member of ASME.

Bristle pig used in pigging 26-inch line on 7-4-51 (see Figure 2). One of this type was used with detergent and two with rinse water.



Discharge of detergent-water solution from 45-degree elbow connected into 26-inch line being pigged. Solution actually was as dark as photo indicates. A steady stream of this lasted for 1¾ minutes before pigs arrived. Thirteen thousand gallons of water was put into the line.

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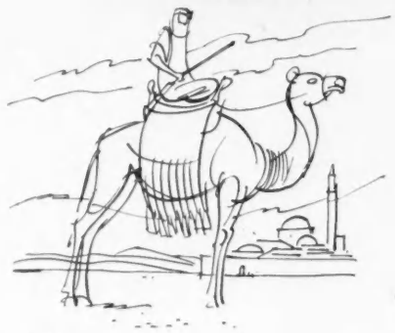

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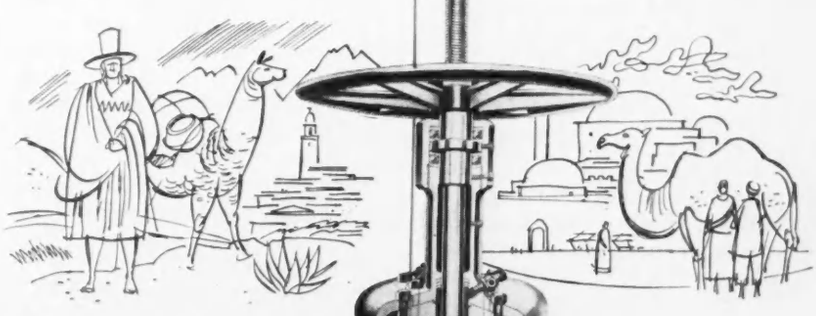

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Magnolia's Corsicana Machine Shop Saves Critical Materials

Pitt Franklin, assistant machine shop foreman, points to weld that ties new side walls to old impeller to increase diameter.

By HUNT GUITAR
Magnolia Petroleum Company, Dallas

MAINTENANCE PROGRAMS of all pipe line companies have in years past been devoted to increasing operating efficiency. Within the past few years another purpose of equal importance has arisen. That purpose is the saving of critically short materials. Magnolia Pipe Line Company's Corsicana machine shop is serving that purpose well.

BY RECLAIMING gate valves, engine and pump parts, Magnolia Pipe Line Company's central machine shop has been offsetting some of the difficulties arising from spiraling costs and material shortages.

The shop at Corsicana, Texas, has been reclaiming as many as 85 hard-to-get, expensive gate valves in a month's time and rebuilding such vital pump parts as impellers, wear rings and bushings, and many diesel engine parts as well.

Pump Impellers Rebuilt

Recently orders came through to increase pump output at the Merkel, Texas, station from 75,000 to 88,000 barrels per day. The proposed 13,000 barrel increase in capacity narrowed itself down to the problem of increasing impeller diameter rather than replacement of existing units. When Engineering and Mechanical departments had finished calculations, it was found necessary to increase impeller diameter from existing 11⅞ to 12¾ inches. The Purchasing department advised that new impellers of required diameter could not be had for several months.

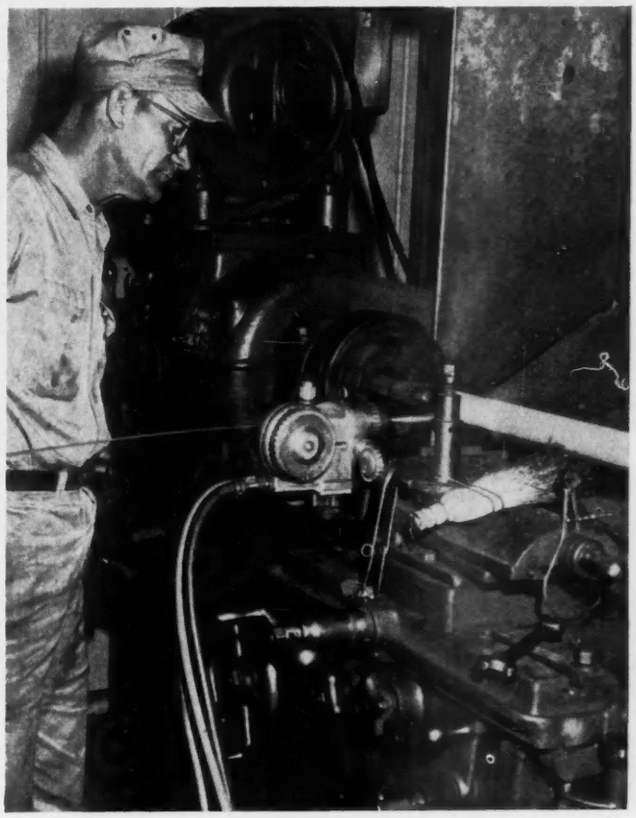
The job was top priority, and with new impellers unobtainable, there was only one course left. The job ended up at Corsicana Machine Shop.

Rather than attempt to convert impellers in use at Merkel, impellers of 10⅜-inch diameter were taken from stock and built up to the required 12¾ inches. The first step taken in the building up process was the welding of extensions to the vanes. For the impeller side walls a special bronze billet 10 inches inside diameter by 13 inches outside diameter, was purchased and a flat ring of required thickness was cut from the billet. Ring inside diameter was then machined to fit outside diameter of the impeller, beveled, and welded into place. The vanes were then securely welded to the new side walls and the impeller sent to the lathe. In the lathe the impeller outside diameter was machined to the specified 12¾ inches and the side walls trued up.

Impeller hub and case rings removed at the beginning of the job were reconditioned and installed on the impeller. With a regular double-cut and a rotary grinder, the inside of the impeller was trued up and finished, the impeller unit balanced and returned to the Merkel station for service on the line.

Although the savings in dollars and cents were very considerable, far more important was the saving in time. The job was done in a matter of days as compared to the several months required to get delivery on new impellers.

The assistant machine shop foreman expects to see these impellers again. "It will probably be a year or so hence when the case ring and hub ring need reconditioning. Next time we will reclaim the wear ring we



LEFT: Machinist Ed Riley tries an old steel sleeve on the new bushing on the centrifugal pump bearing unit.
RIGHT: Venoy Pope, metallizer operator, keeps an eye on the spray of corrosion-resistant steel being applied to a worn centrifugal pump shaft during a buildup step in the reconditioning process.

made this time and make a new case ring. You can always save one or the other."

Wear Rings, Bushings and Sleeves

Wear rings—both case and impeller—come in for a beating in continuous operation of a centrifugal pump. Acting as a sealer between suction and discharge, they must be in first-class shape, and wear must be kept well within allowed tolerances. So wear ring jobs are routine work at Corsicana.

In reconditioning and reclaiming wear rings, both hub and case, double life is obtained from the unit by alternately discarding either the hub ring or case ring, depending upon its operational history. When a ring unit enters the shop for reconditioning, the case ring is machined out, leaving it oversize. A new impeller hub ring is then made to fit the oversize case ring and the ring unit returned to service. The old hub ring is discarded. When the same ring unit comes in again for service, the case ring is discarded, the hub ring machined down to new surface, and a new case ring made to fit.

Much the same procedure is followed in the reclamation of centrifugal pump bushings and sleeves as that followed on the wear ring jobs. Steel sleeves and bronze bushings take turn about in the process of replacement. When shaft sleeve and bushing are in for servicing and were new at beginning of service period, the sleeve is machined to .020 inch undersize and a new bronze bushing made to fit. Next time the bearing unit comes in for servicing, the steel sleeve will have worn sufficiently to make its retention in service inadvisable. The old bushing is machined out to remove wear and brought up to par. A new sleeve is made to fit the bushing and the bearing unit returned to service.

Pump Shaft

Pumps in almost continuous service are hard on shafts. Shafts are ordinarily made of stress-relieved alloy steel and the combination of tough service and sour crude corrosion make shaft replacement a problem. Magnolia reclaims nearly all scored, worn and corroded shafts. In the process of reclamation, one of two methods of rebuilding the shaft is followed. The method depends on a combination of type of service in which the shaft is employed and extent of injuries to the shaft.

For one type of shaft reconditioning, low temperature bronze is employed to build the diameter to excess dimensions. Heat distortion of the shaft is relieved and the shaft then straightened by spot heating. Final step is machining and polishing to finish specification.

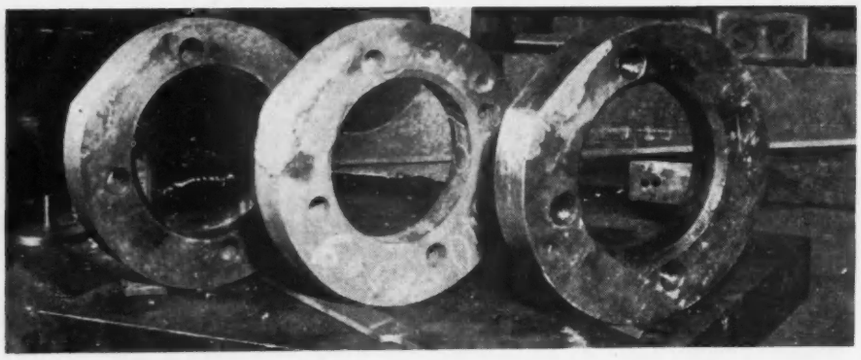
Metallizing is the alternate method employed in reclaiming the shafts. After cleaning, the shaft is metallized with corrosion-resisting steel to fill and roughly level the surface to oversize dimensions. Shaft is then machined, ground, and polished to original size and returned to service. In most cases, the reconditioned shaft is just as true and long-lasting as before.

Reciprocating pump plungers come in for metallizing, too. In the process of reconditioning, a coarse thread is first cut on the plunger. The thread is then flattened and spread somewhat by knurling to allow a grip for the metal that will be sprayed on by the metallizer. As a side point, the metallizer is capable of spraying a coat of metal to a depth of 3/8 inch.

Upon completion of metallizing, the plunger is returned to the lathe, machined and ground to finish and is ready for installation.

Fuel Cams

Pipe liners directly concerned with the operation of power equipment know the significant part a fuel cam plays in the operation of a diesel engine. A worn cam causes late fuel injection with consequent loss of timing and reduction in engine efficiency. With continuous line operation, the



Steps in cam reconditioning. At right is an old cam with lift worn down; in center is a cam with buildup well completed on cam lift; and at left is a nearly completed cam with some facing still to be done.

fuel cam is one of the more vulnerable wear points about the engine, and in a large pipe line system, cam replacement can become an expense item of respectable proportions.

Magnolia has been reclaiming worn fuel cams for about 15 years. At first the work was done by a complicated series of hand operations, matched to a template cut from a perfect cam. Improvements in techniques followed with power grinding equipment gradually replacing hand work and culminating in the efficient process now employed.

Today's cam reconditioning process is an interesting study in the application of production-line techniques on a small scale to get a job done quickly, efficiently and inexpensively. Upon arrival at the machine shop, the worn cam is cleaned and readied for welding. The worn eccentric shoulder is then built up with a hard weld to excess dimensions. Heat from the welding process has naturally distorted the cam and machining follows. The inside diameter is trued up and flat surfaces machined to specification in the lathe. The final step is the finish-grinding of the actual cam surface.

A few years ago one of the machinists at the Corsicana plant decided that considerable time was being lost in the grinding process then used. With other members of the shop force and some experimentation, the idea and planning climaxed into the production line grinding employed today that finishes the fuel cam.

For its third and final step, the cam is placed in the power grinding machine developed by the shop personnel. Through a motor-driven V-belt reduction drive, the cam is rotated at six revolutions per minute against a separately driven high velocity emery wheel. Using a new and perfect cam as a template, a profile tracer follows the template periphery, and guides the cam being ground against the emery wheel. The net result is a first-class cam made with a considerable savings in time, money and materials.

Diesel Injection Pumps

Optimum operating economy and maximum power in a diesel power plant depend heavily on accurate metering of the fuel injected into the cylinder by the injection pump. Magnolia Pipe Line has diesels that have been on the line for as long as 38 years. These older singles, twins, triple and quadruple cylinder engines have had many a fuel pump overhaul since they went on the line. When ready for repairs the fuel pump goes to Corsicana where the old cylinder is bored to oversize and a new plunger machined from stock. The old plunger is discarded.

The shop foreman points out that the "keep one and throw away one" policy is followed here as it is with pump wear rings and bushings and sleeves. The next time the injection pump is in for service, the older barrel will be discarded and the wear machined off the old plunger. A newly-made barrel will replace the discarded one and the cycle continued.

Gate Valves

To the question of reclamation costs versus replacement by capital investment, the gate valve reconditioning shop can give a convincing answer. Although it occupies a relatively small percentage of the total shop area, as many as 85 large gate valves have been reconditioned and readied for service in one month. When one of Magnolia's stations was recently overhauled, the valve shop turned out 37 good-as-new gate valves in a matter of days.

Since each of the gate valves reclaimed is one less to buy, the advantage in replacement cost savings alone is substantial. However, there is another advantage of equal importance. The assistant superintendent of the Dallas District pointed out that when the purchase of the 37 new gate valves for the above-mentioned pump station repair job was contemplated, delivery promises ran to as much as 24 months. The valves were delivered from the Corsicana shop in less than that many days.

High-pressure gate valve reconditioning follows a set routine in the shop. First the valve is boiled in a lye solution for three hours to remove paraffins and other residues. The valve is then disassembled.

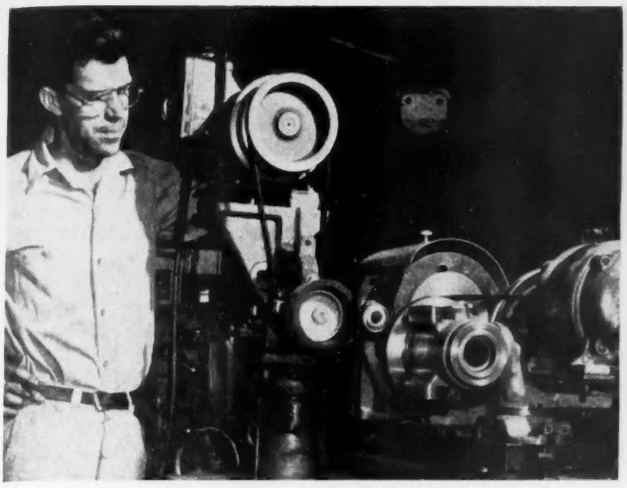
The case rings are cleaned and refaced in the machine shop, then replaced in the valve case using litharge as a sealer to prevent leakage between ring and case.

If the disc is faulty, the old disc ring may be removed and replaced by a solid welded ring which is refaced to fit the valve like new. For future reference, this operation can be repeated if necessary.

At the time the bonnet is disassembled, the stem is cleaned, the threads rechased, and the stem built up to original diameter if so required. Packing in the bonnet is replaced and the valve reassembled. The valve is then ready for testing to see if it will come up to line standards.

The test procedure is as follows: The valve is tightly closed, placed in the test jig, between a serrated blind

Before and after in the valve reconditioning process. Left rear is a newly reconditioned disc, welded and machined; center rear is a disc built up with weld and ready for machining; and right rear is a disc removed from a valve brought in for reconditioning.



LEFT: Machinist W. C. Lewis watches his idea in action—the machine that finish-grinds diesel engine fuel cams.

RIGHT: First step in valve reconditioning is to boil valves in a lye solution for three hours. Above is the gas-fired vat in which the valves are boiled.

flange with a heavy rubber gasket dividing blind flange and valve. On the opposite side of the valve a hydraulic jack serves to press the valve against the flange. Thus, one-half the valve is completely sealed off. Hydraulic fluid is pumped through a small hole in the blind flange until a static pressure of twice the rated pressure of the valve is imposed on the valve. The valve is then carefully examined for leaks.

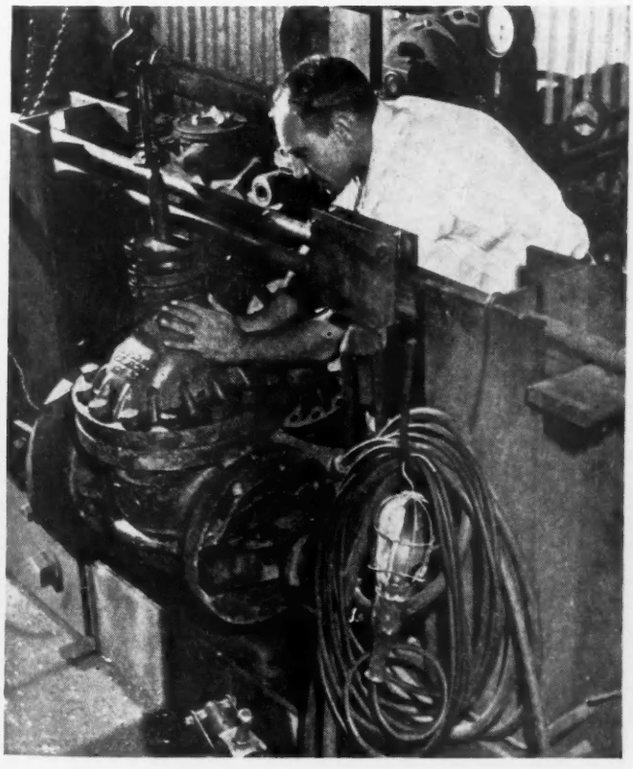
The procedure is repeated for the opposite side of the valve. Should the valve pass the test, the sand-blasting and painting follows and it is ready for application on the line.

The entire testing machine was developed and fabricated in the Corsicana machine shop. Even the hydraulic end of the test pump was made in the shop.

Advantages of the Machine Shop

With spiraling costs and critical shortages of materials that are so necessary to the expansion, maintenance and operation of pipe line systems today, this shop is proving invaluable to Magnolia Pipe Line. The shop has saved money by reclaiming expensive machine parts and valves. But equally important—the shop has saved time.

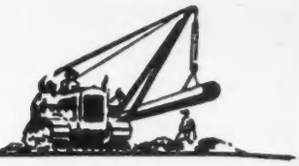
In any large scale pipe line system, time is defined only in terms of dollars. The inability to increase capacity at a critical moment, the dependency upon outside sources for parts that cannot be delivered except in terms of weeks and months—all may be spelled "time," but the yearly statement defines them in terms of dollars only.



LEFT: This is the final step in gate valve reconditioning. Gate valve has been set in a testing machine and the hydraulic fluid is being pumped against the closed gates as Leon Fletcher checks for leaks.

RIGHT: A. W. Frey, assistant superintendent of maintenance for Magnolia's Southern division, holds a reconditioned diesel engine fuel pump plunger and barrel. On the table are a barrel and plunger that have just arrived for servicing.

PIPE LINE *Construction*



By CECIL W. SMITH, WORLD OIL Staff

Projects Announced and Contracts Awarded

Crude Lines

Lakehead Pipe Line Company has awarded contract to Walco Engineering & Construction Company, Tulsa, for the construction of a pump station on its line at Viking, Minn.

Mid-Valley Pipeline Company has awarded contracts for the construction of six booster stations, the installation of additional units at present pumping stations, and the construction of a third crossing of the Mississippi River on its 1000-mile line from East Texas to Lima, Ohio. The 20-inch river crossing was let to J. Ray McDermott & Company, Inc., Harvey, La. Ford, Bacon & Davis Construction Company of Monroe, La., will construct booster stations at Stevenson, La., and Minter City, Miss. C. E. Wilson Construction Company of Kansas City, Mo., will build the station at Simpsonville, Ky. Station Construction Company of Houston was awarded the work on the Hornsby, Tenn., and Elkton, Ky., stations, and Blaw-Knox Corporation, Tulsa, will construct a pumper at Pyrmont, Ohio. Installation of additional pumping units at Longview, Texas; Haynesville, La., Mayersville, Miss., and Abbeville, Miss., will be done by Delta Engineering Corporation, Houston. O. L. Olson of Houston will install an additional pump at Clarkson, Ky. Another will be put into the station at Denver, Tenn., by Station Construction Company, and Dravo Corporation of Pittsburg will add one at Hebron, Ky.

Plains Pipe Line Company plans 20 miles of pipe line from the Denton field area of eastern Lea County, N. M., to the Phillips Pipe Line Company system in the Wasson area of Yoakum County, West Texas.

Plains Pipe Line Company's plans also call for a nine-mile extension of its line from the Germania field of Midland County to the Stanton area of Southeastern Martin County, West Texas.

The Texas Company announced its intentions of installing approximately 30 miles of eight-inch pipe line between the Ventura Avenue field, Ventura County, and the company's pump station at Fillmore, Calif. The new line will provide additional transportation facilities for 15,000 barrels per day.

Product Lines

Salt Lake Pipe Line Company awarded contract to Humiston-Dahl, Inc., Los Angeles, for the construction of two pump stations at Juniper, Idaho and Baker, Ore., on the Salt Lake City to Pasco, Wash., line. The additional power will boost the system's capacity from 17,000 to 22,000 barrels per day.

Sunray Oil Corporation has employed the Refinery Engineering Company of Tulsa to construct two booster stations of 500-horsepower each on its Duncan-Allen product line and one station of 700-horsepower on the Drumright-Allen line. The stations will be remotely controlled by micro-wave communication systems.

Natural Gas Lines

Algonquin Gas Transmission Company let a contract for 92 miles of 24-inch line between Hartford, Conn., and Boston to Anderson Bros. Corp., Houston, and work got under way late in July. Contracts for the remaining 150 miles of 26-inch between Lambertville, N. J., and Hartford will be awarded this fall.

Associated Natural Gas Company has received FPC authorization to construct 88 miles of pipe line from Texas Eastern Transmission's main line in southeastern Missouri to 14 Missouri municipalities. Facilities will serve Morehouse, Lilbourn, Essex, East Prairie, Charleston, Chaffee, Bloomfield, Bernie, Benton, Oran, Malden, Clarkton, Holcomb, and Kennett.

El Paso Natural Gas Company has asked FPC for permission to build a 1980-horsepower compresson station near Shell Oil Company's TXL plant in Ector County and an 1100-horsepower station near Phillips' gasoline plant in Gaines County, West Texas. The stations would cost $453,000 and $291,000, respectively.

Lone Star Gas Company plans 30 miles of 12-inch pipe line from the Bronte field, Coke County, West Texas, to the company's system at Maryneal in Nolan County.

Penn-Jersey Pipe Line Company petitioned FPC for authorization to lay a six-mile, six-inch line from the Manufacturers Light & Heat Company's Coatesville-Port Jervis pipe line to Phillipsburg, N. J.

Southern Natural Gas Corporation awarded contract for 40 miles of 24-inch loop lines in Louisiana and Mississippi to Associated Pipe Line Contractors, Inc., Houston.

Southwest Gas Corporation received FPC authorization to build 27½ miles of four-inch pipe line from Pacific Gas & Electric Company's 34-inch line and Barstow and Victorville, Calif.

Texas Eastern Transmission Corporation awarded contract for a crossing of the Tennessee River near Florence, Ala., to the Oklahoma Contracting Company, Inc., Dallas. Work was scheduled to get underway late in July.

Texas Gas Transmission Corporation awarded a contract to Houston Contracting Company, Houston, for the laying of 181 miles of 26-inch pipe between Eunice, Acadia Parish, and the company's facilities at Bastrop, Morehouse Parish, Louisiana. The contract is subject to FPC approval of the project.

Projects Starting

Crude Lines

Gulf Refining Company (Pipe Line Division) had L. E. Farley, Inc., Houston, start 64 miles of ten-inch pipe line between Eucutta and Lumberton, Miss. This line is a section of the planned 152-mile Eucutta to Mobile carrier.

Texas-New Mexico Pipe Line Company awarded contract to Carl H. Dunn, Fort Worth, for 27 miles of eight-inch and 2.7 miles of six-inch pipe line from the Scharbauer and Sweetie Peck fields, Midland County, to the Basin Pipe Line System's Midland station. Work was scheduled to start immediately and to be completed about the middle of September.

Product Line

Tuscarora Oil Company, Ltd., had Pipe Line Construction & Drilling Company, Camp Hill, Penn., start 50 miles of ten-inch pipe line in western Pennsylvania.

Projects Completed

Crude Lines

Edmonton Pipe Line Company, Ltd., completed in August 20 miles of pipe line from Josephs Lake field, Alberta, to Interprovincial Pipe Line Company's station at Edmonton.

Crude Transit Company recently completed 50 miles of four- and five-inch crude lines from the Fall Creek and Perth fields, Sumner County, to Arkansas City, Kansas.

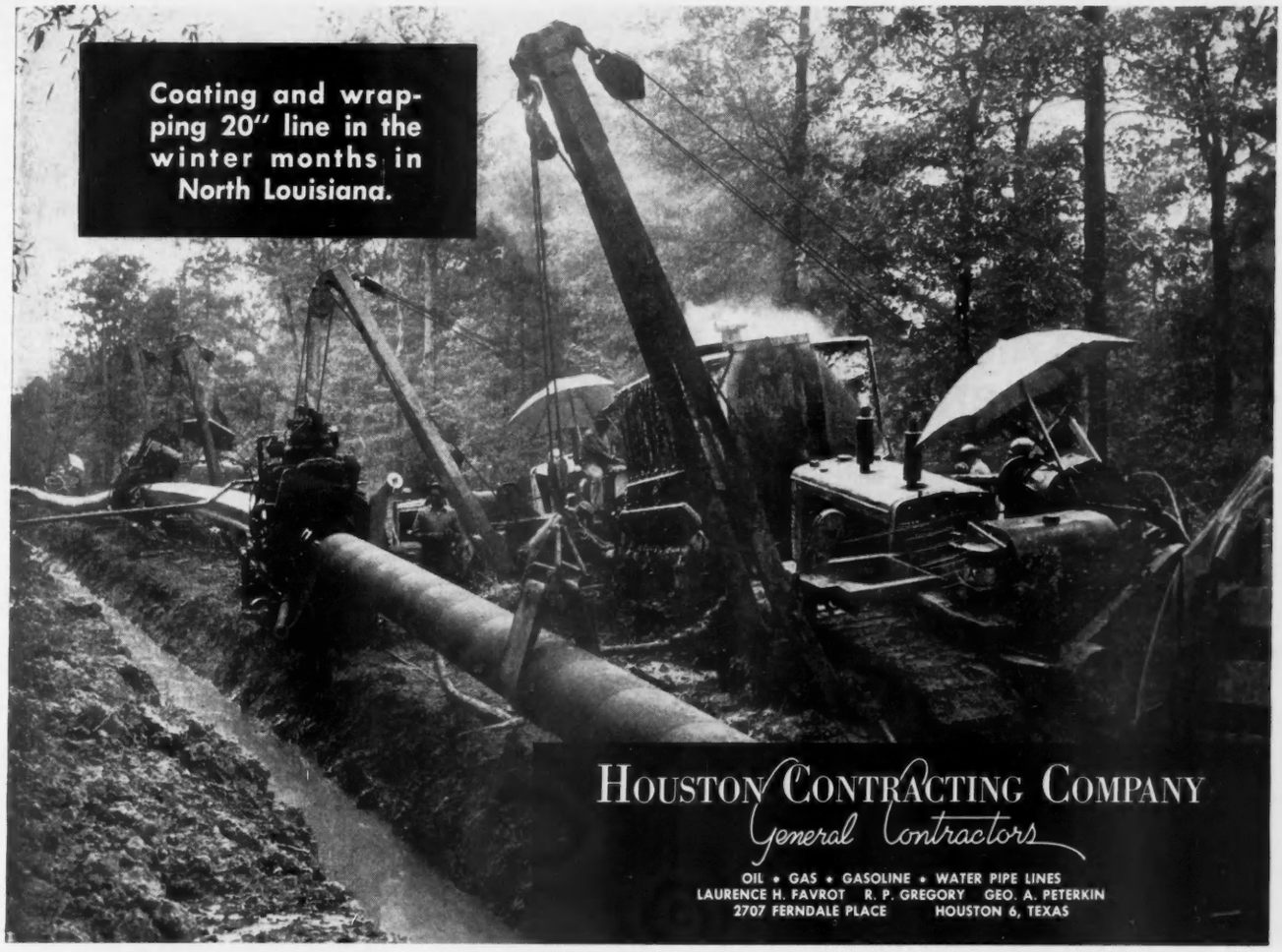
Product Line

Tuscarora Oil Company, Ltd., completed 57 miles of 12-inch pipe line from Reading to Harrisburg, Penn. Pipe Line Construction & Drilling Company, Camp Hill, Penn., did the job.

Natural Gas Lines

Tennessee Gas Transmission Company completed 46 miles of 30-inch loop lines between Eros and Galion, La. Construction was done by Houston Contracting Company.

Union Gas Company of Canada, Ltd., completed 53 miles of 16-inch line from Windsor to Dawn Township compressor station in Ontario. Work was done by Shaw Pipe Line & Construction Company, Sarnia, Ont.



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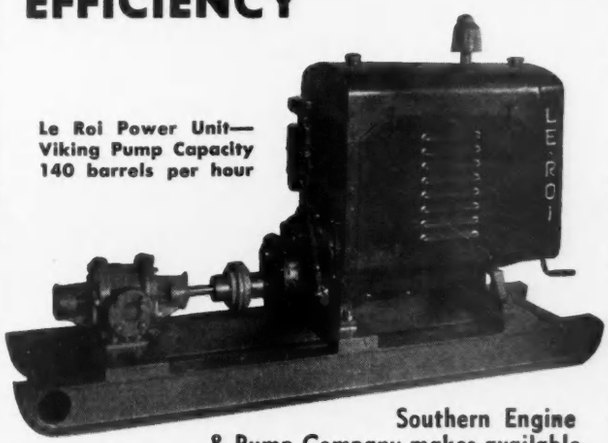
THE RIGHT TEAM FOR EFFICIENCY



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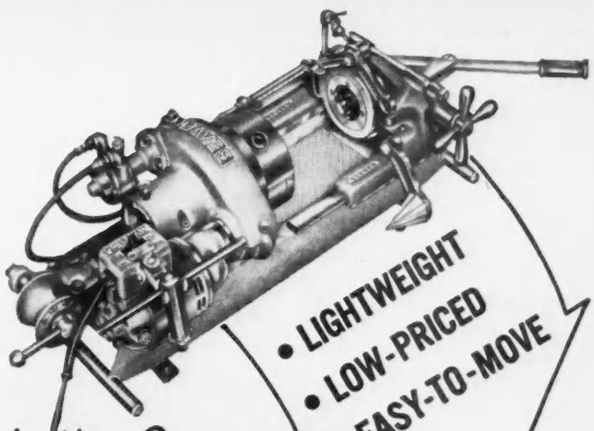

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the New Beaver
Model-E Pipe and Bolt Machine

The new low-priced, lightweight Beaver Model "E" is a "junior edition" of the heavy-duty Beaver Model A—which has, for the past 20 years, been the recognized leader in the field of portable pipe and bolt machines.

Although designed primarily for hardware stores and small piping contractors and industrialists, BIG contractors will find the new Model "E" useful on jobs requiring extreme portability.

A pipe machine is no better than the service back of it and our 50 years of experience in this field, and our reputation for high quality and friendly service, is your best guarantee of complete satisfaction.

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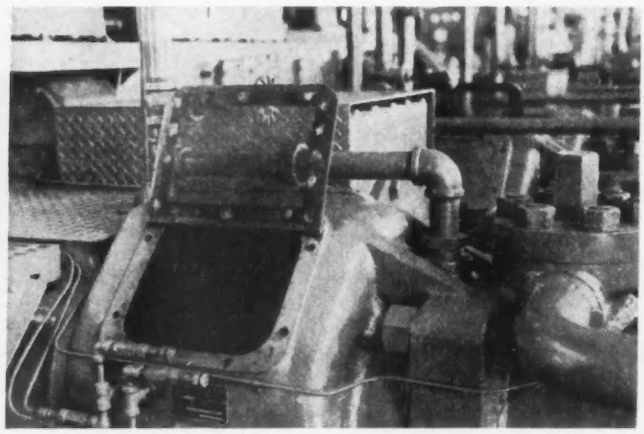
How to do it! PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, WORLD OIL, P. O. Box 2608, Houston 1, Texas

HOW TO—Screen Inspection Plate

A cover plate that permits visual inspection of the compressor crosshead, rod and packing and at the same time provides additional crankcase ventilation, can be made from fine mesh screen and a light metal frame.



The frame is made in two sections joined with piano hinges. The upper section, secured to the engine with cap screws, simply holds the inspection plate in place. The lower hinged section, made from light metal strap to which a fine mesh screen is soldered, lays flat against the machined inspection plate seat with no fastenings. Thus it can be instantly opened when the operator desires to inspect the packing rods or crossheads. This is of particular advantage during the period immediately following the installation of a new piston rod, when overheating is likely.

The fine mesh screen provides for additional crankcase breathing during engine operation.

HOW TO—Cool Small Pumping Unit

Installation of an inexpensive heat exchanger permits the use of incoming crude to provide cooling for power equipment at a small pipe line pump station. At the same time, a more efficient pump operation can be achieved, due to the lowered viscosity of the warmed crude oil.

For many years, refineries and large power plants have used exchangers to provide additional heat economy, but only in recent months has this practice been applied to outlying pipe line stations.

One company always orders its power units less radiator, and then installs a heat exchanger to allow engine heat to be absorbed by the liquid being pumped—crude oil, in the case illustrated. The exchanger is installed at a convenient spot outside the engine room, and part of the crude is shunted through its tubes. Cooling water from the engine is circulated through the shell of the exchanger. A thermostat on the system maintains proper engine temperature.

Since it is not necessary to have a fan, power consumption is reduced, and the engine room temperature is lower during the summer months.

HOW TO—Mount Water Can Beneath Truck Bed

One of the most vulnerable pieces of equipment on a pipe line field truck is the all-important water can. It is often severely damaged by being bounced around during travel over rough terrain or being struck by pipe or other equipment loaded on the truck. In addition, the can usually occupies a good portion of otherwise usable bed space. In overcoming these disadvantages, one crew has their water can mounted in a support that is hung below the bed level, the top being made flush with the bed. Protecting the top is a circular steel plate cover which can be latched in place flush with the truck bed. As shown, the water can is accessible and is in a position where it will not suffer the damage it might sustain if it were set up on the truck bed. Mounted at this lower level, the full can is more easily lifted up and lowered down into position without the exertion that was formerly required when it was located at higher points on the truck.

This month we'll ship our 30,108th mile of large diameter welded line pipe

This month we will have shipped 30,108 miles (4,500,000 tons) of A. O. Smith Line Pipe for the world's growing pipe line networks.

In the latter part of 1927, when A.O.Smith introduced its large diameter, high strength, welded line pipe, the entire industry could turn out no more than three miles of large diameter pipe per day. *By 1928,* A. O. Smith had increased its capacity to more than 15 miles per day.

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Since that time, by every means known to science, the SMITHWAY process of pipe manufacturing has been ceaselessly developed and perfected, offering ever greater assurance of accuracy, uniformity and reliability.

Today A.O.Smith is still the leader in the development and manufacture of large diameter line pipe and practically every major pipe line is wholly or partly built of our pipe.

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HOW TO—Install Improved Welding Rod Storage Box

An unusually neat, easily-made welding rod storage box designed for use on the field welding truck is illustrated. The box, made of light steel plate, is 11 inches square by 18 inches deep and is mounted at an angle somewhat greater than 45 degrees from vertical so that maximum protection is given to the rods, yet maximum accessability is afforded the welder when he is selecting the rods he needs for a particular job. Equipped with a

tightly-fitting, light gauge steel cover that lies back out of the way when opened, the compartmented box takes up little room on the back of the truck and, being elevated on the triangular supports, leaves truck bed space that is available for working area or storage of miscellaneous pipe or fittings.

PEWTHERS' *"EARTHRIPPER"*

OPENS THE EARTH LIKE A ZIPPER!

ECONOMICAL... Pewthers' EARTHRIPPER saves money three ways! It costs less—it's speedy operation saves labor costs . . . and standardization of automotive parts cuts down maintenance costs. Construction engineers who use the Pewthers' EARTHRIPPER have found that it costs only 4c a foot to operate. This low cost covers initial investment, depreciation, operation, maintenance, and labor over a three-year period! With an EARTHRIPPER, one man can handle your ditching problems, from driving the machine to the ditch site to lowering the boom and opening the earth at a maximum rate of twenty feet a minute! Because all gears run in oil, the EARTHRIPPER can be used for years with few replacements of parts. If you want to save time and money, invest in an EARTHRIPPER today.

MOBILE... The EARTHRIPPER is versatile because it is mobile. On the highway its speed is the speed of the truck. The raised boom clears telephone wires and tree branches, making transit easy and speedy, even in heavy city traffic. The EARTHRIPPER digs vertical ditches in any kind of terrain under almost any digging conditions. On slopes the frame levels. While the tires follow the contour of the earth, the ditcher digs a vertical ditch! If you need a ditcher for large or small ditching jobs, the EARTHRIPPER can solve your problems.

EFFICIENT... For straight, clean ditching, the answer is Pewthers' EARTHRIPPER. This new, unique ditcher offers a complete different design. It is the first ditcher to be built into a truck. Bucket design saves time because there is no loss of time in cleaning. Bottom of each bucket forms the top of the preceding one. The buckets separate as they go over the top sprocket, throwing the dirt onto the conveyor belt. Conveyor belts throw the dirt on either side of the ditch and can be reversed on a moment's notice. In competition the EARTHRIPPER digs straight ditches with clean sides . . . in record time.

Send for the folder on the new Pewthers' ditcher, the EARTHRIPPER. Learn for yourself how the EARTHRIPPER can save time and money on any small ditching job! Ask for a demonstration before purchase . . . at any point in the United States!

Pewthers' "EARTHRIPPER" is the only ditcher built into a truck. This means *one man* can handle your ditching job, from driving the machine to the ditch site to opening the earth to a maximum depth of five feet. The EARTHRIPPER is particularly suited for gas lines, extensions and house-to-street service lines. Utility ditching requiring ditches 10", 14", or 18" wide are duck soup to this new, *different* Pewthers' ditcher.

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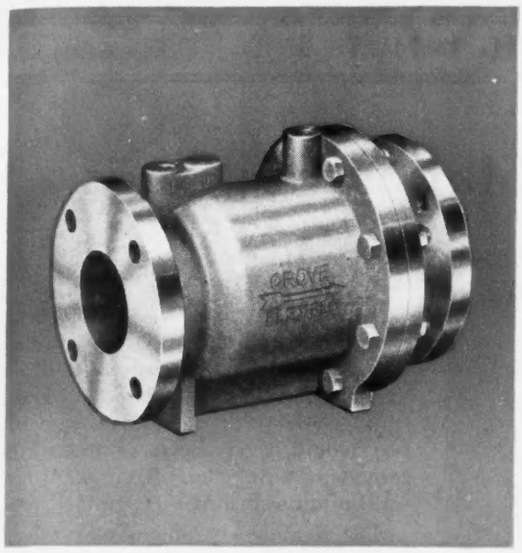
HOW TO—

Build Rack to Store Shovels at Job Site

An easily constructed rack located near the construction office provides workmen with a place for storing



Far simpler operation and maintenance with versatile Flexflo Valves

FLEXFLO Valves are basically diaphragm-operated, using an expansible tube as both diaphragm and valve. With only four simple parts including but one non-metallic moving part, Flexflos assure long, trouble-free service with minimum attention. Field replacement of the simple tube-core assembly affords new valve performance in a matter of minutes. Depending upon the operating system used, positive-acting Flexflos give highly efficient service as:

BACK PRESSURE REGULATORS
PRESSURE REDUCING REGULATORS
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CONSTANT FLOW VALVES
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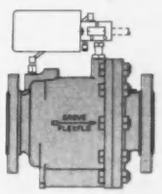
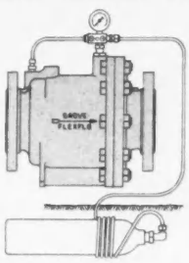
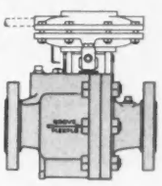
REMOTE CONTROL VALVES
AUTOMATIC SHUT-OFF VALVES
. . . and many other applications.



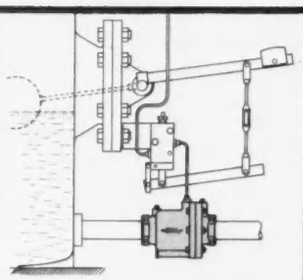
Model 80-41F. Solenoid-operated Flexflo for on-off service.



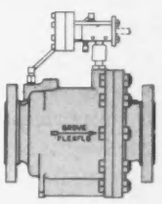
Model 888. Flexflo Dome Pressure Loaded Reliever for back pressure or relief service.



Model 898. High pressure Separator Oil Dump Valve for operation from level pilot.

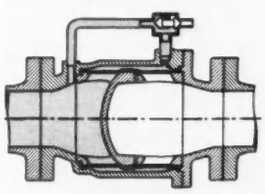


Model 80-899. Separator Oil Dump Valve for operation from float lever.



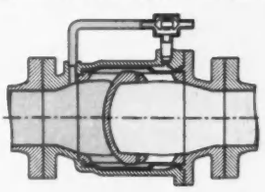
Model 80-42F. Pressure-operated Flexflo for on-off service.

flexflo lets pressure do the work:



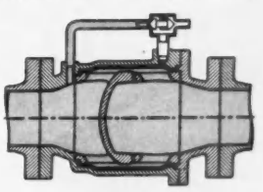
CLOSED

1 The only moving part in the Flexflo Valve is a tough Buna N tube stretched over a cylindrical slotted metal core. When closed, line pressure from within, tending to force tube off core, is opposed by equal jacket pressure. Tension of the tube itself forms a positive, bubble-tight seal. The tube conforms to uneven surfaces and is hence unaffected by foreign matter or erosive wear.



THROTTLING

2 As jacket pressure is reduced, line pressure begins to roll the tube off the core, opening the valve. Throttling is smooth and even. The Flexflo reacts instantly to the slightest pressure variations, compensating automatically for surge or shock impulses. Stability at all flow positions is accurately maintained. Fluttering and chattering are reduced to a minimum.



OPEN

3 When all jacket pressure is removed, the tube is forced completely off the core and the valve assumes its wide open position. Full flow capacity with minimum pressure drop is assured. As Flexflo employs no hinge-pins, guides or other metallic moving parts, no troublesome problems of corrosion or wear are encountered. It cannot stick, wedge or slam.

GROVE

Grove Flexflo Valves and Regulators are adaptable to air, gas, oil, water and other fluids at temperatures to 150° F. Available in iron or steel, sizes 1" to 12", for working pressures up to 1500 psi.

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shovels, gravel scoops, picks and post hole diggers.

One compressor station construction company fabricated the handy rack shown. Located near the construction office where workmen turn in time cards, it proved easy to insure the return of tools at quitting time.

The rack was made of rough timbers. A 6 x 12-foot bottom framework was made entirely from rough 2 x 8's; the outside framing members were tied together with joists two feet on center. Three rough 2 x 8 uprights about seven feet long supported a top stringer on the flat. Nails driven about three inches apart on both sides of this member provided racks for long-handled shovels. Six pairs of four-foot cross members of rough 2 x 6's provided racks for short handled shovels as shown. These members were supported by two 2 x 8's running the length of the rack and by short risers nailed to the bottom framework. Additional rigidity was supplied by 1 x 4 bracing from the bottom frame to vertical members.

HOW TO—Drain Station Buildings

A sump with a float actuated pump saved money in providing drainage for a compressor station located in a swampy terrain.

Natural drainage would have been expensive as miles of deep ditches would have been necessary to drain the surrounding countryside. Long runs of deep ditches on the plant site would have been necessary to provide gravity flow from compressor building drains.

The drainage problem was solved by a company which constructed a simple sump with a float actuated, electric motor-driven pump alongside the compressor building, and carried all compressor basement drain lines to it. Here the water was pumped through a two-inch line located about three feet below grade, to a nearby drain ditch. There the water joins plant site drainage, and is pumped to nearby lowlands.

The sump was more than paid for by eliminating the eight-inch, deep, tile lines.

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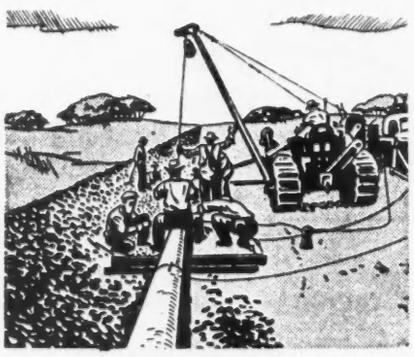

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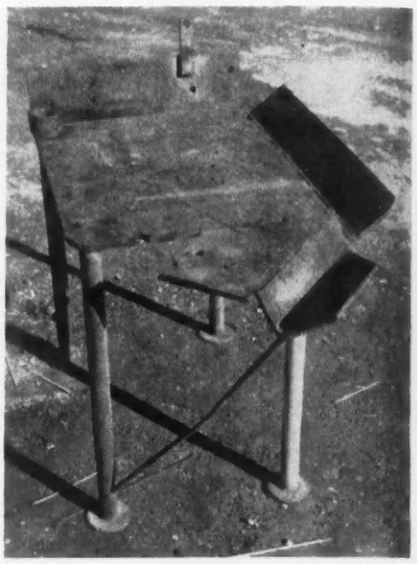
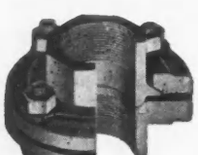
HOW TO—Fabricate 45-Degree Jig

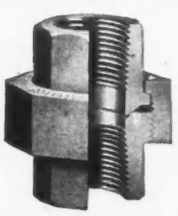
To speed up and simplify the task of cutting or welding of frequently-made 45-degree turns in pipe line pumping station repair or construction work, one welding crew built the handy welding bench shown. The jig was made of scrap materials and mounted on four legs fitted with steel discs at the bottom to afford a more sturdy base when set up in soft ground. The bench has permanently welded to it two pieces of six-inch angle iron, installed at a carefully-measured 45-degree angle. A gap of ample size is left at the junction of the two angles to permit cutting and welding of pipe, angle material or structural pieces without damaging the permanent segments of the jig. The angles are sufficiently large to permit a wide range of pipe sizes to be set up and fitted. Spotted in the yard at a point convenient to the scene of operations, the bench quickly pays for itself in both welders' time and material saved.



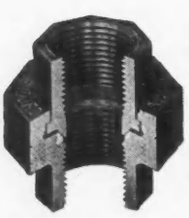
Jefferson Malleable Unions



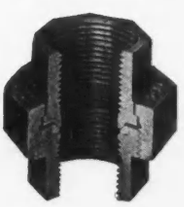
STYLE "B"—3-Part Ground Joint pipe line flange union greatly facilitates the laying of pipe and especially where pipe is out of alignment. Certified Air Furnace iron. Sizes ½" thru 10".



STYLE "A"—Ground Joint union and union fittings. Complete line straight and reducing. Sizes ⅛" thru 2½"—3000 lb. test; 3" and 4"—2000 lb. test. Made of Certified Air Furnace iron.



ENDURO—300 lb. S.W.P.—600 lb. C.W.P. unions. Sizes ⅛" thru 3".



EXCEL—250 lb. S.W.P.—500 lb. C.W.P. unions. Also a complete line of unions, ells and union tees with union on the run. Made of Certified Air Furnace iron. Sizes ¼" thru 3".

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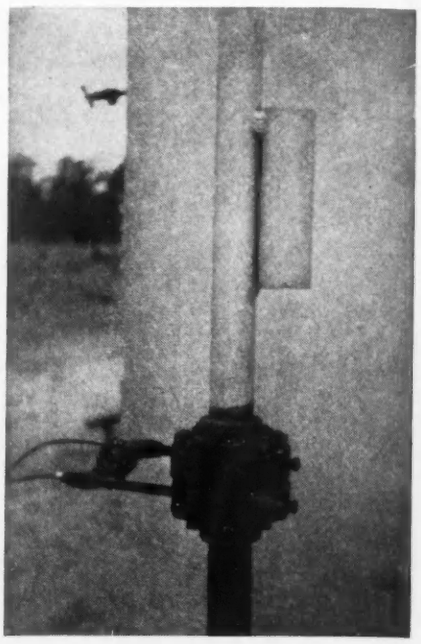
HOW TO—Arrange Meter Support

Where it is necessary to measure the gas flow one month or so out of the year in order to obtain an average rate of flow from each lease, a simple meter support may be arranged as shown.

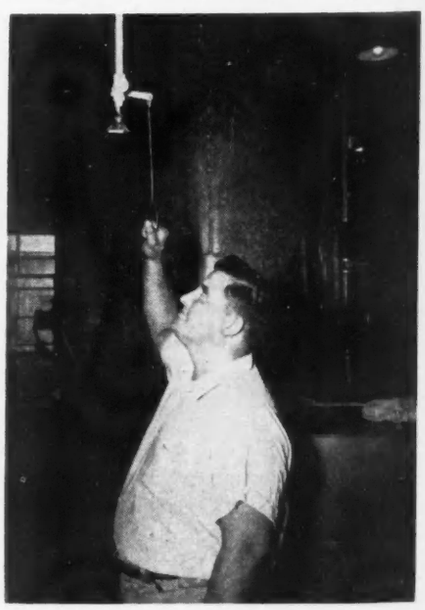
A section of 2½-inch pipe is welded in a vertical position to receive the two-inch meter support. A three-eighths-inch nut is then welded to the side of the 2½-inch nipple and a bolt inserted into the nut to make a set screw. The two-inch pipe for the meter support is slipped inside the 2½-inch nipple and the set screw tightened.



HOW TO—Safeguard Employes From Chemical Burns

An easily made emergency shower provides means of minimizing acid burns in a water treating building at a gas compressor station.

The shower was constructed by installing three quarter inch pipe to the doorway of the water treating building where acids and other harmful chemicals are handled every day by operating personnel. To the end of the pipe a quick opening three quarter



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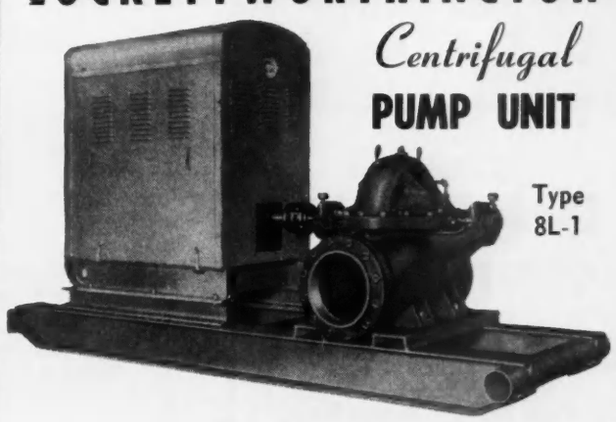
Type 8L-1



The pump illustrated is a Worthington Type L Single Stage Volute, directly connected to an automotive-type engine. Ideal for oil field and general-service use. Capacities up to 2000 G.P.M.—heads to 300 feet.

Lockett Dealers can furnish, on short notice, Worthington Pumps, adapted for use with any type or make of power unit—gas, gasoline, Diesel, electric motor or steam; and also genuine Worthington Repair Parts from nearby warehouse stock. Whether you require a pump, or a complete pump unit for a specific type of work, you are assured of getting dependable performance from a Worthington Pump, and prompt, interested service through a Lockett Dealer.

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inch plug valve was screwed. On the end of the valve, an ordinary shower nozzle was installed. A handle for the shower was made from a length of 3/16-inch acetylene welding rod as shown.

When an operator suffers acid burns, he can quickly flood himself by pulling the handle of the quick-opening valve.

HOW TO—Lay Pipe in Sour Soil

When it is necessary to lay pipe in swampy river bottom land where soil is sour, combination support and hold-downs may be arranged as shown.

Concrete piers, set 18 inches below grade, are notched as shown to receive three sizes of pipe. A piece of angle iron fastened across the top prevents pipe from floating during floods.

Three main advantages result from this installation: pipe is out of corrosive soil, no coating and wrapping are necessary, and drips are eliminated by sloping the pipe in direction of gas flow. A large drip was installed at the lowest point.

Precasting the concrete piers saves money and time on this installation.

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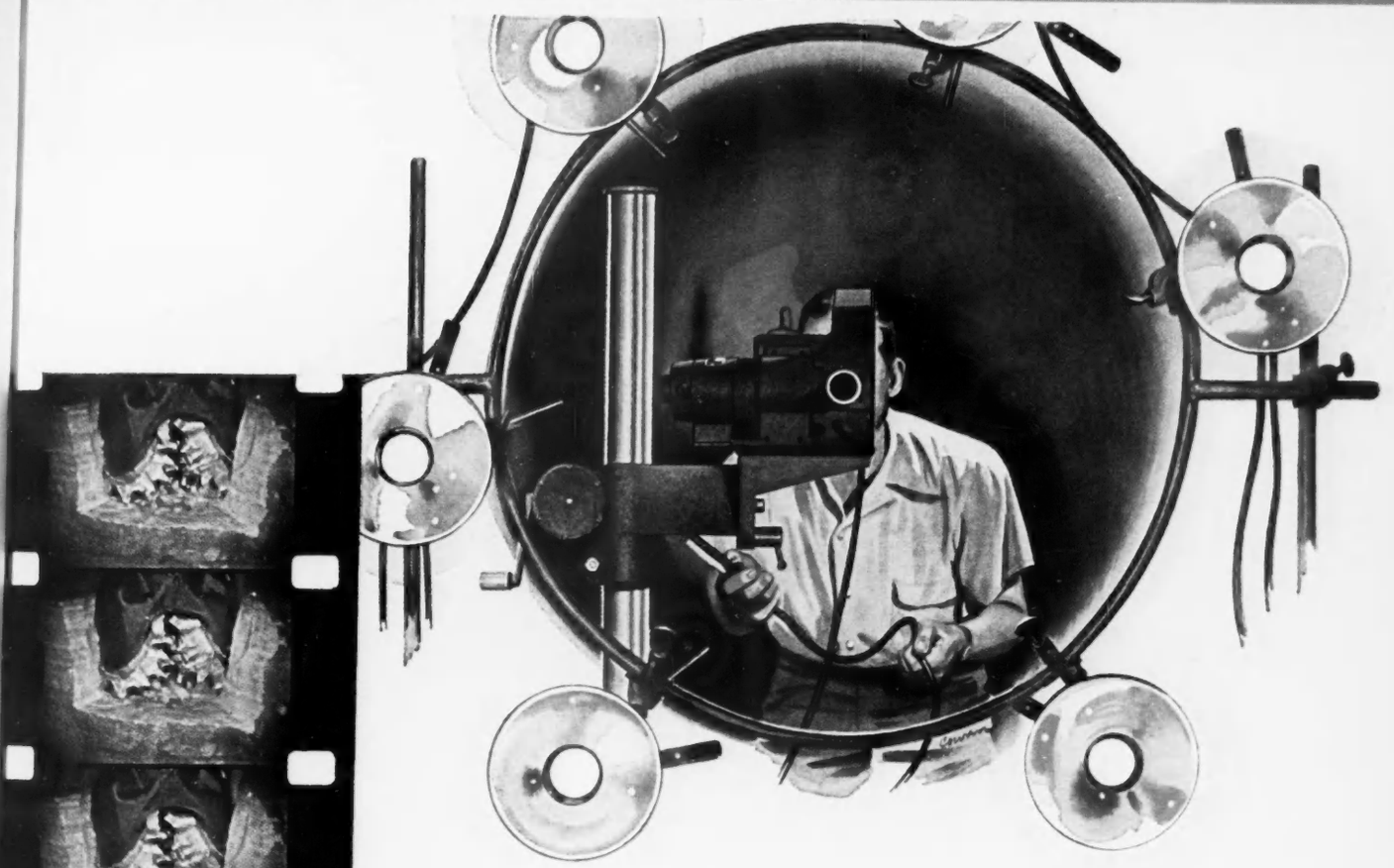
International Section

DON KLIEWER, SECTION EDITOR

WORLD OIL



BIT ACTION IN *SLOW MOTION*

Motion pictures, taken at 3000 frames per second—*100 feet in two seconds*—are being used to study bit performance at the Hughes research laboratory.

Focused on a bit drilling in a test block, the high speed camera records, in slowest of slow motion, how the teeth bite into the formation; shows effect of tooth structure, tooth spacing and other design features on drilling efficiency.

Details, impossible to see with the naked eye, become crystal clear when the high speed film is projected on the screen.

This is only one of the many modern tools used by Hughes research engineers in studying rock bit performance. Supplemented by data obtained from millions of bits run on thousands of rigs, this research enables Hughes to design and build the industry's best rock bits.

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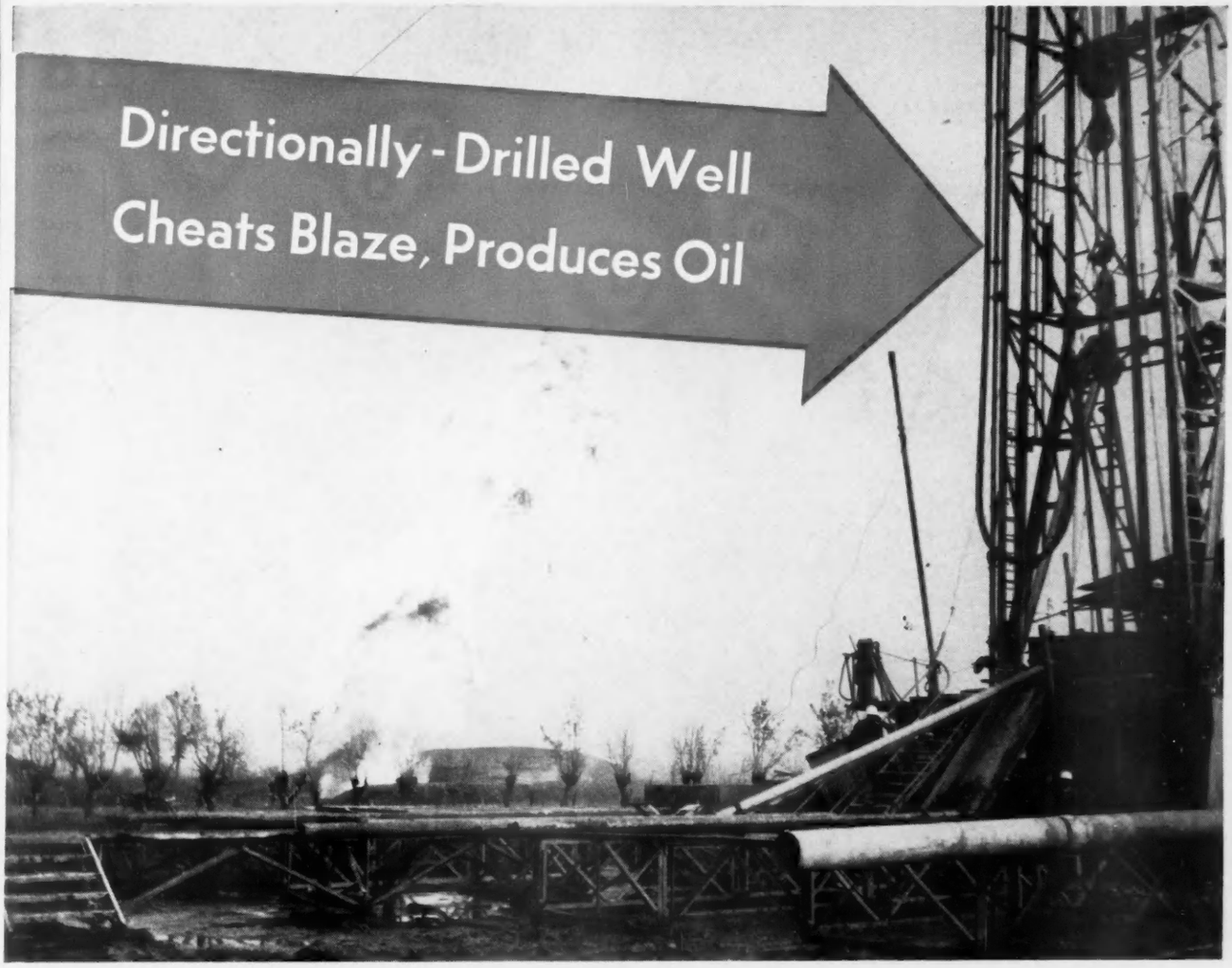
Directionally-Drilled Well Cheats Blaze, Produces Oil



Relief well in foreground, burning well beyond.

By GEO. E. JUSTICE
Vice President of Manufacturing and Services
Houston Oil Field Material Company, Houston

DIRECTIONAL DRILLING is an exacting science. To stem a blazing well which caught fire at 5314 feet in the Cortemaggorie field near Bersano di Besanzone, Piacenza state, Northern Italy, was a successful achievement in itself. But officials of Azienda Generale Italiana, the Italian government oil agency, watched as American ingenuity, tools, and precision workmanship went a step further — and completed the relief well as an oil producer.

PRECISION pays off.

Azienda Generale Italiana Petroli, the Italian oil agency, watched American ingenuity in action when a relief well was drilled to stifle a fire resulting from a blowout in the Cortemaggorie field near Bersano di Besanzone, Piacenza state, Northern Italy. Not only did the relief well extinguish the blaze, but it was completed as a producer.

Santa Fe Drilling Company of California had drilled AGIP's Well 21 to 5314 feet under normal operating conditions. An electric log was run to the bottom, and side wall coring was attempted. While the cores were being taken, an accident occurred and a fishing job resulted.

During fishing operations, a swabbing action was noticed, but later disappeared; however, as the drill pipe was being pulled, swabbing recurred. With all drill pipe out of the hole and drill collars sitting in the rotary slips, the well blew out.

Minutes later, the well was ablaze and the derrick collapsed. No one was seriously injured; the derrick man escaped by sliding down the ladder before the derrick fell. Flames from the well reached several hundred feet and lighted the countryside for miles.

A fire extinguishing company flew technicians from the U. S. to the site but on the day of their arrival the top three or four joints of the casing parted and were blown out of the crater. Their plans to extinguish the fire and cap the well were abandoned.

After this new and more serious situation, AGIP consulted its technicians and decided to drill a directional well to the depth of the sand section in the immediate vicinity of Well 21. Houston Oil Field

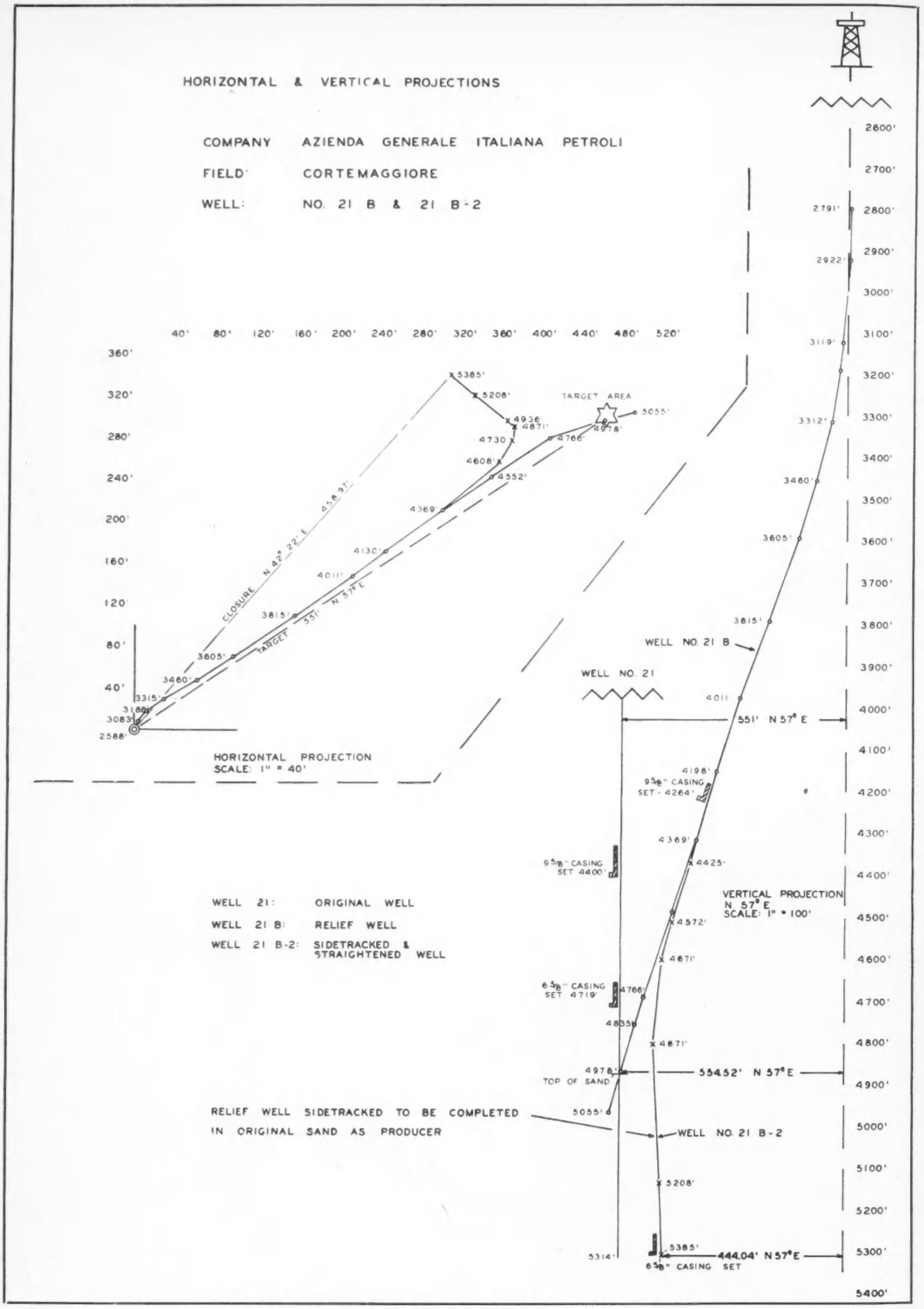

HORIZONTAL & VERTICAL PROJECTIONS
COMPANY AZIENDA GENERALE ITALIANA PETROLI
FIELD: CORTEMAGGIORE
WELL: NO. 21 B & 21 B-2
TARGET AREA
CLOSURE N 42° 22' E 458.97'
TARGET 551' N 57° E
HORIZONTAL PROJECTION
SCALE: 1" = 40'
WELL 21: ORIGINAL WELL
WELL 21 B: RELIEF WELL
WELL 21 B-2: SIDETRACKED & STRAIGHTENED WELL
RELIEF WELL SIDETRACKED TO BE COMPLETED IN ORIGINAL SAND AS PRODUCER
WELL NO. 21 B
WELL NO. 21
WELL NO. 21 B-2
9⅝" CASING SET - 4264'
9⅝" CASING SET 4400'
6⅝" CASING SET 4719'
6⅝" CASING SET
TOP OF SAND
551' N 57° E
554.52' N 57° E
444.04' N 57° E
VERTICAL PROJECTION
N 57° E
SCALE: 1" = 100'

DIAGRAM SHOWING PATH OF DIRECTIONAL HOLE.

Material Company, Inc., Houston, was selected to supervice the directional drilling.

Kyle E. Perry, HOMCO directional drilling engineer, and about 4400 pounds of directional tools and equipment were flown from Houston to Rome, Italy.

While Perry and directional equipment were en route, attempts were made to salvage as much of the drilling rig as possible. Through the efforts of Drilling Foreman George Henry and his crew, 3 pumps, an engine, a string of five-inch outside diameter internal flush drill pipe, and 3 steel mud pits, were salvaged in good condition. Recovered, but slightly damaged, were the drawworks, the drawworks base, and two engines. A full string of 2⅞-inch O.D. drill pipe, the kelly, the swivel, and the other miscellaneous drilling equipment were lost in the crater.

The original plan for the directional relief well was to set 800 feet of 13⅜-inch O. D. casing; drill a 12¼-inch hole to 3350 feet; drill off vertical at that depth with an 8½-inch hole; ream to 12¼-inch to 4400 feet; set 9⅝-inch O. D. casing; and continue drilling an 8½-inch hole at an angle of approximately 18 degrees to 5383 feet. This would result in a total deflection of 551.69 feet and the true vertical depth of 5300 feet, which was the caluculated depth of the lower sand section in the wild well.

However, upon Perry's arrival, AGIP decided to locate the relief well 551 feet from the Well 21, start the deflection from vertical in the relief well at 2900 feet, and continue deflection to a true vertical depth of approximately 4892 feet, calculated to be in the horizon of the top of the upper sand in the wild well.

Whipstock Set

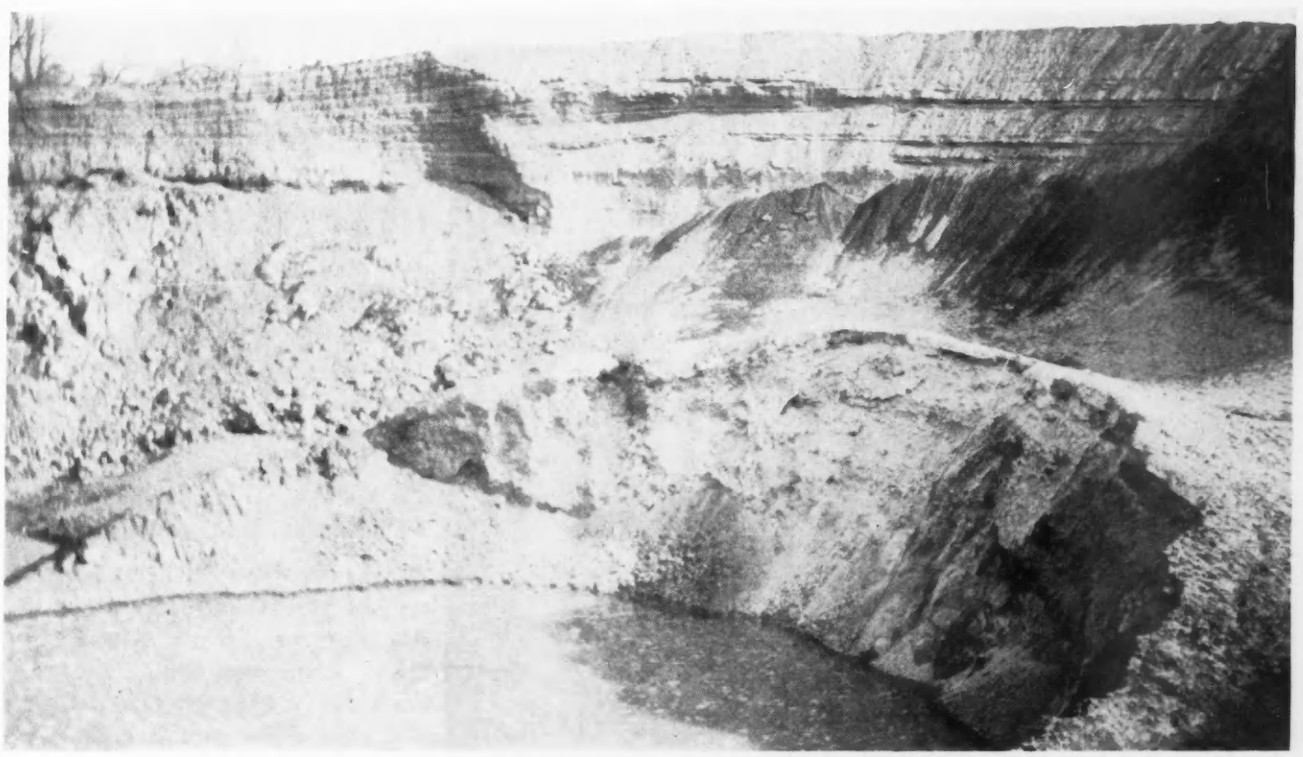
Accordingly, 13⅜-inch O. D. casing was set at 1738 feet. A 12¼-inch hole was drilled to 2922 feet where the first whipstock was set. An 8½-inch hole was directionally drilled and subsequently reamed to 12¼-inch in stages to 4264 feet where 9⅝-inch O. D. casing was set. After setting the 9⅝-inch O. D. casing, the 8½-inch deflected hole was continued to the target area of 4891.95 feet true vertical depth or a total depth of 4978 feet. Total horizontal departure at that depth was 554.52 feet. Drilling was continued through the sand to a total depth of 5055 feet. The 8½-inch hole was drilled and subsequently reamed in stages for the reason that seven-inch O.D. ribbed whipstock was used due to the more favorable shipping weight.

By only seven whipstock settings, perfect results were obtained. The bore of the directionally drilled relief well at 4978 feet total depth or 4891.95 true vertical depth, was within less than three feet of the wild well, assuming it to be vertical.

At 5055 feet, the total depth of the relief well, it was decided to attempt to break down the formation with water. Formation broke down at 1500-pound pump pressure and 4400 barrels of mud were pumped into the formation. The morning of January 6, 1951, the fire in the wild well was extinguished and the well was dead; subsequently, 6,000 sacks of cement were pumped into the wild well for a final shutoff.

After the wild well was controlled, it was decided to sidetrack the relief well as far as possible from the bore of Well 21 and complete the relief well for production. A cement plug was set in the relief well at 4369 feet or 105 feet under the 9⅝-inch O. D. casing. By carefully controlled directional drilling and accurate surveying, only five whipstock settings were required to drill the sidetracked hole to 5385 feet total depth or 5308.39 true vertical depth. Bottom of this hole was approximately 158 feet from the bottom of the original Well 21.

The sidetracked hole of the relief well, now identified as 21-B2, was logged, 6⅝-inch O. D. casing set, and completed for a producing well.



Crater left by the burning well.

1 OVERSEAS OBJECTIVE: From the U. S. to a foreign country, say, Venezuela, is a long hop, but oil companies annually employ thousands of persons who want experience and opportunities offered abroad. To obtain foreign employment, the procedure is complex, thorough. Here, the applicant enters the Margaret Moore Employment Service offices at Houston.

✶

So You Want

2 RECEPTION: He is greeted by Miss Bonnie Rosanky, the receptionist, who conducts the initial interview designed to determine generally the applicant's adaptability for foreign work. After this discussion, he is given a blank form which calls for varied personal information and background data.

✶

3 APPLICATION: Miss Rosanky assists him with whatever problems may arise over the completion of the application, which must be filled out in minute detail and at length because it will remain with his records during his overseas employment. It is upon the basis of the information he gives here that the applicant may be considered for a foreign job.

4 INTERVIEW: Miss Claudia Brown, interviewer, discusses further with him his education, experience and background. At this time, he is called upon to explain in detail his reasons for seeking overseas employment, his job preferences, and why he thinks he is qualified. From this discussion, Miss Brown rates him on his general acceptability.

a Foreign Job..?

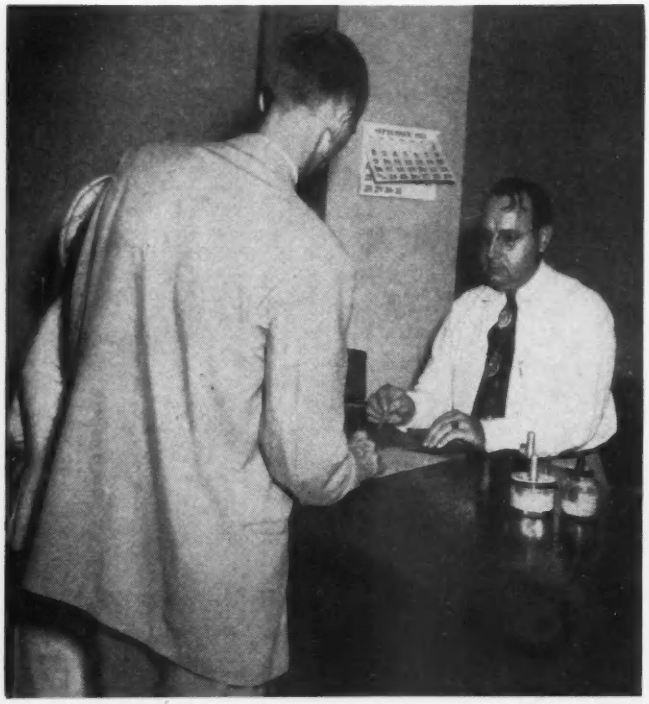
5 DISCUSSION: Miss Moore then receives the application, and checks the ratings marked by Miss Rosanky and Miss Brown. If Miss Moore decides his records fulfill prerequisites established by foreign companies and her agency, she communicates with a prospective employer who previously has filed his personnel needs with her agency. If a vacancy exists in the applicant's field, the processing is rushed.

6 ACCEPTANCE: After Miss Moore's 'phone call to him concerning the qualifications of the prospective employe, the company representative often visits the agency to interview the applicant. If the applicant is "hired on the spot," the company representative may show the new employe on the map where he will be sent, discussing the area in general and explaining what conditions he may expect to find.

■ CONTINUED ON NEXT PAGE →

7 INOCULATION: The job assured, the new employe must begin a series of inoculations, types of which depend upon his destination. Nurse Catherine Babin receives a list of "shots" he is to be given; the hypodermic is prepared, he flinches, and the ordeal is ended.

8 PHOTOGRAPHS: To satisfy visa requirements, he visits a photographer for a picture which will be attached to the travel permit he will carry while residing outside the continental limits of the U. S. The permit is proof of his U. S. citizenship.



9 TRAVEL PERMIT: A visit to the office of W. Paul Harriss, chief deputy clerk, U. S. District Court, winds up the preparation for his departure to his overseas job. The papers are forwarded to Washington for State Department approval, after which they are taken for approval and recording to the consul of the country which is his destination.

10 DEPARTURE: The plane lands at Municipal Airport, its departure is announced over the loudspeaker, and the employe is greeted by Hostess Dorothy Hilt as he enters the plane. Settling into a seat, his waiting has ended. The plane roars down the runway, soars into the air, and speeds him to his new job and new life.

from every field, the reports pile in:

Tomorrow's Tools – Today!

When we introduced the new A-2 Bullet Perforator, we knew what it would do. We'd proved it. But now, only a few months later, operators in nearly every field have proved it for themselves. "Much greater penetration" say the reports from one oil area after another. And many reports claim that the figures we first quoted are more than conservative. However, since these exceptional jobs may represent unusual or purely local conditions, we'll simply repeat our first proved-by-test figures on the A-2 Bullet Perforator . . .

28% to 47% Greater Penetration

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KINGDOMS OF OIL

No. 7

MIDLAND, TEXAS

By JAMES C. WATSON

Permian Basin Oil Service and Oil Editor, Midland *Reporter-Telegram*

FROM AN ARID, sparsely populated region of the late 1800's, the Permian Basin now is a well-settled oil-producing region boasting almost 600 recognized fields, 39,735 producing oil and gas wells and an annual yield of crude approaching the 300 million barrel level. A center of this West Texas oil wealth is Midland, a modern, progressive city of more than 22,000 population which once hauled its water from Monahans, 55 miles to the west.

MIDLAND, a sun-scorched community, dozed in the late 1800's beneath the cloudless, blue skies that roofed the 90,000 square miles of arid West Texas, an area whose scant vegetation bore no trace of the vast inland sea that covered it in the dim past of unrecorded time. With an average annual rainfall of approximately 15 inches, the land offered little to the scraggly cattle and sheep which grazed disappointedly over the terrain. Residents of Midland, then called Midway, a 55-mile waterhaul from Monahans to the west, were chary in their use of water. They never dreamed they were walking dusty trails above vast stores of hidden oil. Nor did they guess their stock stared longingly into dry creek beds which lay above reservoirs of water.

This land of the hot breeze was destined, however, to play a role in the fascinating story of the search for oil—the fabulous and elusive will-o'-the-wisp which has played a major role in vaulting the nation into greatness and West Texas into prominence and a position of wealth.

Midland, county seat of Midland County, which was carved out of Tom Green County in 1885 and organized that same year, owes its original name to its geographic location near the center of West Texas—about 300 miles west of Fort Worth and 300 miles east of El Paso. It is situated on the southern edge of the High Plains and is approximately 45 miles east of the southeast corner of New Mexico.

ABOVE PHOTO: The famed Hotel Scharbauer has been the setting for many an oil deal.

The first known white settler in what is now Midland County was a man named Lum Medlin, an antelope hunter who was plying his trade when H. N. Garrett reached the county in a search for cheap grazing land for sheep and cattle in 1882.

Garrett found surrounding the town of Midland open, unfenced range land for which $1 an acre was the going price. The highest figure quoted at that time was $5 an acre for some of the acreage held by the Texas and Pacific Railway, which was built through the area in 1882.

Progress and population poked along past the turn of the century and through the early 1900's until 1923, when the first producing oil well in the central part of the Permian Basin was completed as Texon Oil & Land Company's University 1, in southwest Reagan County. That well opened the Big Lake field into which streamed the thousands of persons who hopefully trailed after oil booms.

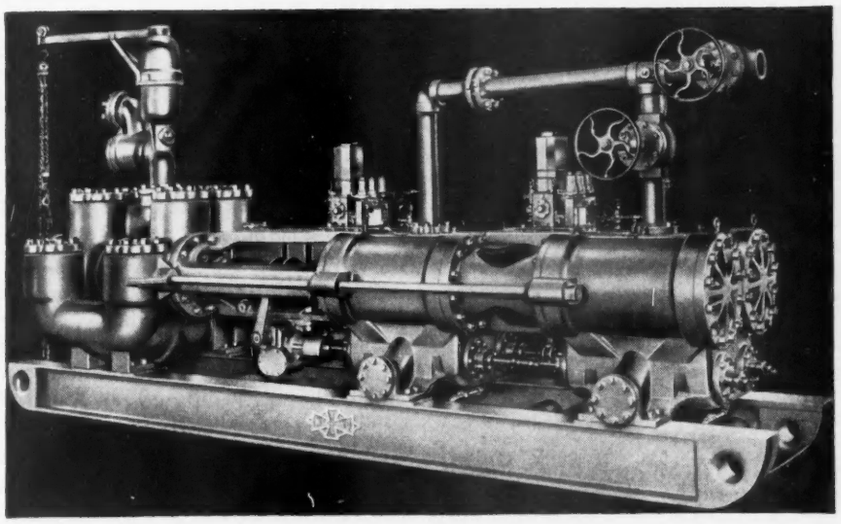
The Big Lake field developed the first of the sustained, prolific petroleum production in the Permian Basin and drew the interest of many oil companies. A comparative lull followed the Big Lake discovery for three years.

An end to the lull, however, was not long in coming. When it arrived, it blazed across the west like a meteor

the WHELAND
QUAD STEAM PUMP

H-20000-BAB 16½" x 16½" x 20" – 8", 7½", 7"

- **Eliminates compounding troubles**
- **Either one or both steam cylinders may be used as desired**
- **More economical than two separate pumps**



- **Equivalent to a two cylinder duplex pump with cylinders 23-5/16" bore**
- **Steam horsepower equivalent of two 16½" x 20" x 8" pumps**
- **2,875 lb. mud pressure at 300 lb. steam with 8" liners**
- **9.584 to 1 steam to water ratio with 8" liners**
- **Liners need changing less frequently**
- **"Upside down" steam ends, patented**
- **Net weight only 32,800 lbs., with skids**

Here's a pump with all the "guts" for big steam rigs. The specifications below tell its story, and each day the units in operation demonstrate the efficiency and values of WHELAND H-20000-BAB QUAD PUMP.

H-20000-BAB WHELAND QUAD STEAM PUMP SPECIFICATIONS

Steam cylinders	16½" and 16½" x 20"
Hydrostatic test on steam cylinders	700 P.S.I.
Steam pressure, maximum working pressure	350 P.S.I.
Speed, normal R.P.M. each side	50
Steam pipe size to each cylinder	4"
Exhaust pipe size from each cylinder	4"
Main cylinder, piston rod diameter	3¾"
Auxiliary cylinder, piston rod diameter	3¼"
Water piston rod diameter	3⅛"
Water piston rod fitted for No. 6 A.P.I. piston tie rods, diameter	2¼"

FLUID END

Material, solid one piece steel casting	
Hydrostatic tested, discharge ports to	6000 P.S.I.
Hydrostatic tested, suction ports to	3000 P.S.I.
Maximum working pressure recommended	3000 P.S.I.
Discharge pipe, standard size	4"
Suction pipe, standard size	10"

COMPLETE MECHANICAL DETAILS ON REQUEST

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Midland's business district, 1951.

on a dark night. In quick order, the McElroy field in Crane and Upton counties was discovered in April, 1926; the Hendrick field in Winkler County three months later; and the record-breaking Yates field in Pecos County in October.

These major discoveries led to further interest in the central part of the Permian Basin. Companies and operators, anxious to establish headquarters for intensified exploration, development and production activity, cast about for possible office locations. Midland filled the bill—it had a direct railroad to Fort Worth, Dallas and other eastern points; it was situated on U. S. Highway 80, which was being paved at that time; and it had the old Llano Hotel, a four-story masonry structure and then the only hotel of any size and with modern conveniences in the central part of the Permian Basin.

Then, as many of the oil companies and operators were considering whether to establish offices in Midland from which to watch activity in Crane, Upton, Pecos, Winkler and other adjacent counties, the prolific shallow production in the Howard-Glasscock area was discovered.

That settled it for many companies. Gulf Oil Corporation opened an office in Midland in 1926. Prairie Oil & Gas Company moved its West Texas district land and geological offices to Midland. Others came along.

While this flurry of activity descended upon them, with the attendant spiraling of business, Midland citizens quickly realized that if the community were to keep the oil company offices after the initial furor, office space and additional hotel and housing accommodations would have to be provided.

That Midlanders succeeded in their efforts is indicated by the current roster of oil companies and oil operators in business there now—more than 400, not including the scores of drilling contractors, service concerns, specialty companies and other allied petroleum operators.

The beginning of this success can be traced back to 1928, when Dr. John B. Thomas completed Midland's first modern office building—the six-story Thomas Building. This building now is known as the Leggett Building, named for Dr. L. W. Leggett, who purchased it in 1946.

In 1928, T. S. Hogan completed the 12-story Petroleum Building. In the same year, the late Clarence Scharbauer completed the first unit of the modern six-story Scharbauer Hotel, the storied site where transactions dealing with untold millions were completed from chairs in the lobby—chairs that served as offices for many lease and oil operators.

To meet the demands resulting from continued progress and growth since World War II, Midland citi-

Midland on Christmas Day, 1891.

really centers your casing!

The scientific design of the Baker Model "G" Casing Centralizer (Product No. 910-G) enables the springs to yield REALLY EFFECTIVE CENTERING FORCE, even after repeated flattening from passing through "dog legs" and hole restrictions. Exhaustive tests prove that these springs take practically no permanent set—far less than any other centralizer.

The Model "G" Centralizer is available in all sizes, in three size ranges, thus providing a combination of size and bowed-height of springs "tailor-made" to meet your specific requirement, with maximum efficiency.

There is a specific size of the Baker Model "G" Casing Centralizer to meet any combination of casing sizes in relation to the size of the open hole, without compromise or adjustment. The result is EFFECTIVE LANDED CENTERING FORCE far exceeding that obtainable from any other spring-type centralizer.

The springs of the Baker Model "G" Casing Centralizer are scientifically designed to provide additional assurance of cementing success. The vertically mounted springs act like runners on a sled and do not cut into mud or soft formations like springs which are spirally mounted. Springs on the Model "G" Centralizer do not scrape off the mud cake as they are lowered down the hole, eventually building up a bridge ahead of the centralizer; they do not remove or loosen the mud cake opposite a low-pressure zone so that the cement slurry (under pressure) breaks down such formation and channels out into the low-pressure zone. The springs on the Model "G" Centralizer readily pass through a key-seated section of the hole, with no danger of catching under the shell (or key-seat) and breaking off—an ever-present danger with spirally mounted springs.

Operators who know all the facts about the Baker Model "G" Casing Centralizer specify and run them exclusively. They know from experience that they are buying the greatest possible centering force for their casing, to be applied *exactly where they want it in the hole*. Isn't that what you too expect and really want from a casing centralizer?

BAKER OIL TOOLS, INC.

HOUSTON • LOS ANGELES • NEW YORK

GET EFFECTIVE LANDED CENTERING FORCE WITH BAKER CASING CENTRALIZERS

The nine-story Midland Tower, one of the city's newer office buildings.

Midland's Petroleum Building was erected in 1928 by T. S. Hogan.

zens have erected the nine-story Midland Tower. Then the first six floors of the new McClintic Building and the first two floors of the Permian Building were constructed.

Before the McClintic Building was finished, the six-story Wilkinson-Foster Building was started. Now six more floors have been added to the McClintic Building and four more floors have been added to the Permian Building. Additional buildings have been constructed during the past six years until now the Midland skyline forms a backdrop to the Permian Basin that is a tribute to the role of oil in the economy of West Texas.

Certain the oil business is no "fly by night" enterprise, Midland is planning for the future. Cultural activities, entertainment, recreational, religious, and educational facilities have kept pace with the oil-stimulated progress of Midland.

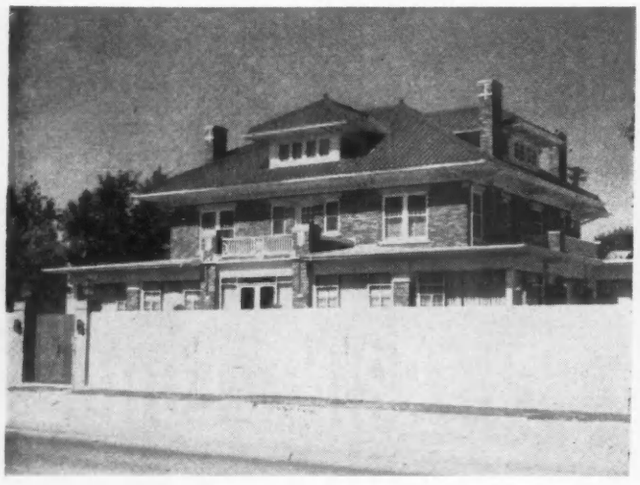
The spirit of Lum Medlin, the antelope hunter; of H. N. Garrett, who started the first sheep ranch in the region, and of T. B. Wadley, who began the first business establishment, a lumber yard, still thrives among the people of Midland today.

And still the search for oil is continuing. Optimism reigns over the possibility of additional oil reservoirs in the Permian Basin and Southeast New Mexico—where there are 595 recognized oil fields with 39,735 producing oil and gas wells.

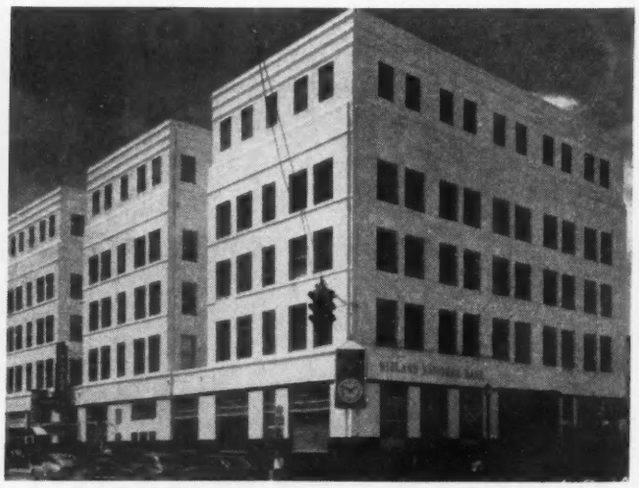
In 1950 the oil wells produced 299,954,560 barrels of oil, with a cumulative total of 3,324,617,576 barrels.

Midland is said to have more oil companies—major and independent—and more independent oil operators, traders and brokers listed in the city directory than any other city in the U. S.

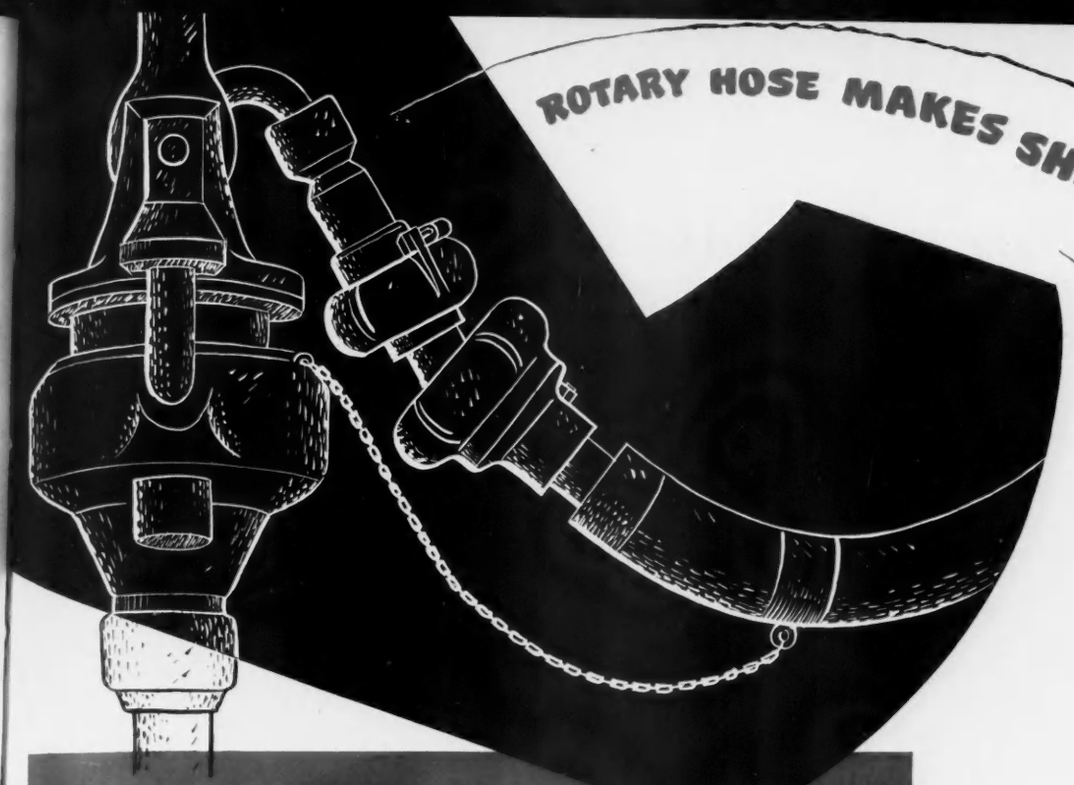
Midlanders and residents of the Permian Basin figure that is a pretty good record for a sun-scorched community of the 1800's which dozed beneath cloudless, blue skies and hauled water 55 miles.



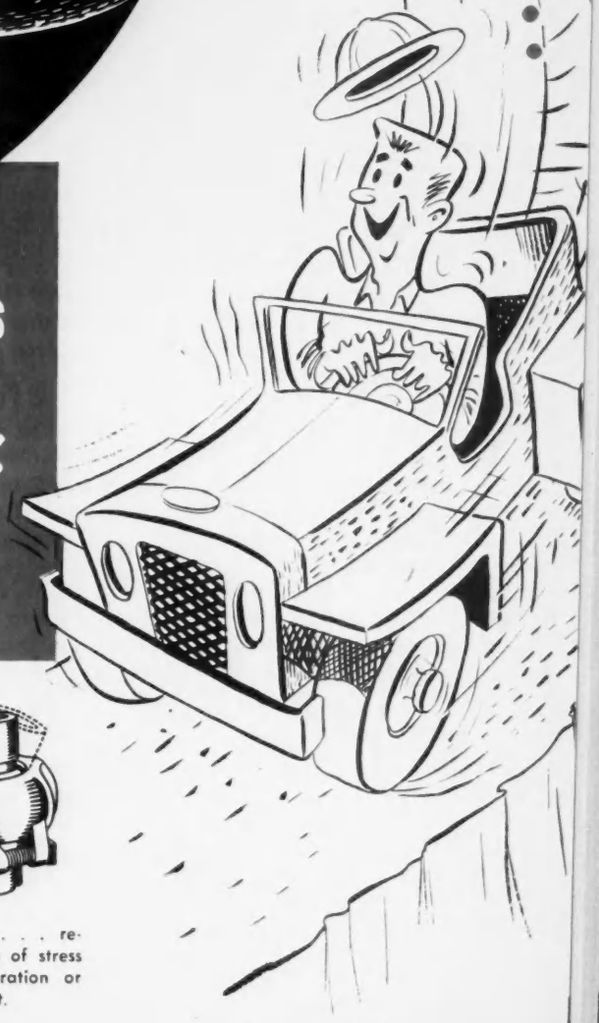
Midland's Petroleum Club.



Crawford Hotel and Midland National Bank.

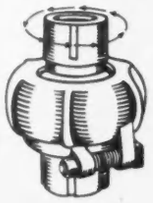


ROTARY HOSE MAKES SHARP BENDS - TOO . . . .

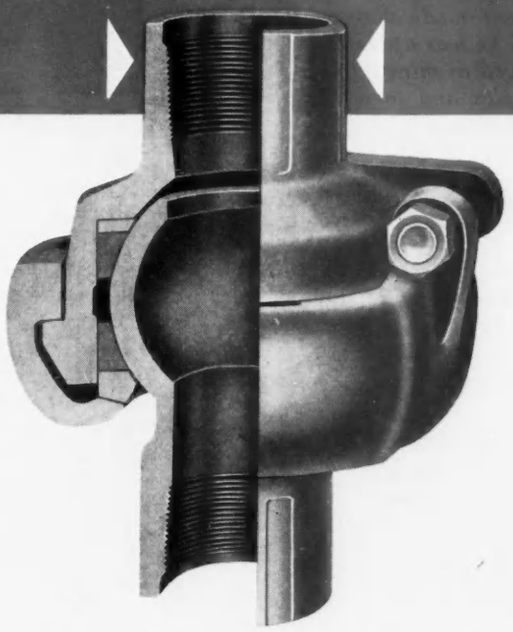


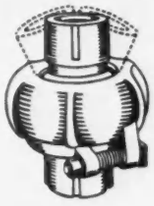
UNIBOLT FLEXI-BALL JOINTS

Relieve the Strain



IT SWIVELS . . . an advantage when making up in a manifold.





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Relieving rotary hose of damaging strains is one of several popular applications of UNIBOLT Flexi-Ball Joints. They are equally desirable in mud manifolds to facilitate making up misaligned connections and to keep them free of stress; on steam lines to protect them against contraction and expansion; on any line subject to intermittent vibration and pulsation.

A feature which distinguishes the Flexi-Ball Joint from all others is the use of the UNIBOLT Coupling principle, rather than threaded connections, to connect the ball and socket members. Release only one bolt to break the joint. ***There are no threads to gall and freeze.*** It may be used safely in any service since it is made in steel only. Sizes from 1½" to 6"; test pressures to 6,000 lbs., 500 lbs. steam working pressure.

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HOUSTON, **TEXAS**

Way is Clear for Continued High Production in Venezuela

An interview with

DR. ANTONIO MARTIN ARAUJO

Venezuelan Ambassador to U. S., Washington, D. C.

EDITOR'S NOTE: *Dr. Antonio Martin Araujo, Venezuelan ambassador to the U. S., recently completed an air tour of Texas, which covered oil and gas production, transportation and distribution facilities, and information on oil and gas conservation practices within the state. Declaring that Venezuela was "America's best friend," Dr. Araujo pointed out during his tour that Venezuela had 72 million acres of land which had yet to be explored for oil. Here Dr. Araujo answers some pointed questions which are related to current boom conditions in Venezuela and prospects of the future, both matters of wide importance in view of the Iran furor and subsequent loss of oil. Dr. Araujo became a well-known dermatology specialist after his graduation in 1928 from Central University of Caracas with an M.D. degree. After serving his internship at Vargas Hospital in Caracas, he was associated with the Department of Health. Subsequently, he was director of medical service at Reverend Hospital in Trujillo; medical director of Creole Petroleum Corporation's hospitals in Cumerebo, San Joaquin, Mata Negra and Temblador; and assistant medical director of the company's hospitals at Caripito and Quiriquire. In 1945 he was appointed governor of his native state of Trujillo. From 1947 to 1948 he served as minister of communications, and from 1948 to 1950 he was minister of health and social welfare. He was appointed ambassador to Washington in December, 1950.*

DR. ARAUJO

Q. *Venezuela, the world's largest oil exporting nation and second largest oil producing nation, is the first nation under Civil Law to depart from the old mining code practice of requiring a discovery of oil before an exploitation concession could be granted. What has Venezuela found advantageous in the move? Is this procedure given any credit for the current oil boom in Venezuela?*

A. It is true that the Venezuelan oil legislation does not require a discovery of oil before an exploitation concession is granted and, furthermore, the concession does not carry the direct obligation to drill wells. But an annual surface tax which is increased periodically is levied on the concession. Under this system, about 9500 producing wells have been drilled in Venezuela, with a total discovery of 14.5 billion barrels of oil and a present production of 1,700,000 barrels per day.

Q. *The 1943 Law of Hydrocarbons permits an exploration-exploitation concession for a period of 40 years with one extension permissible for a like term. After the 80-year maximum period, all properties have to be turned over to the nation. Does Venezuela have a program designed to develop additional petroleum industry technicians to handle the future giant operations which are now handled to some extent by foreigners and which the state will one day assume?*

A. No matter what type of oil operation will be dominant in my country in a near or remote future, it has been a traditional policy in my government to develop additional petroleum industry technicians among Venezuelans.

Q. *Concern is being felt in Venezuela that labor's persistence in laying a high payroll burden on operating oil companies, as a result of the newly-signed contract at Caracas, may eventually result in pricing Venezuela oil out of the market. What is your opinion of that possibility?*

A. I think that the present trend for increased oil production in Venezuela answers this question. Namely, the recent government decree bettering the working conditions in the oil industry does not result in pricing Venezuela oil out of the market.

Q. *What petroleum and natural gas conservation methods are being carried out in Venezuela?*

A. In accordance with the Hydrocar-

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UNMATCHED for boosting condensate recovery

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Ask your Parkersburg representative to show you the actual case histories of Hyreco Profit-Making Performance!

Each Hyreco installation adds to the record of successful performances which this high pressure gas condensate processing unit is establishing. In every case the operator has been able to recover more condensate . . . substantially increase revenue from his gas wells . . . lower operating cost by prevention of line freezing trouble and expense.

No similar equipment available today can process high pressure gas at such low temperatures . . . recover such a high percentage of condensate and pay for itself in such a short time. You owe it to yourself to get all the facts about the revenue-increasing possibilities with Parkersburg Hyreco.

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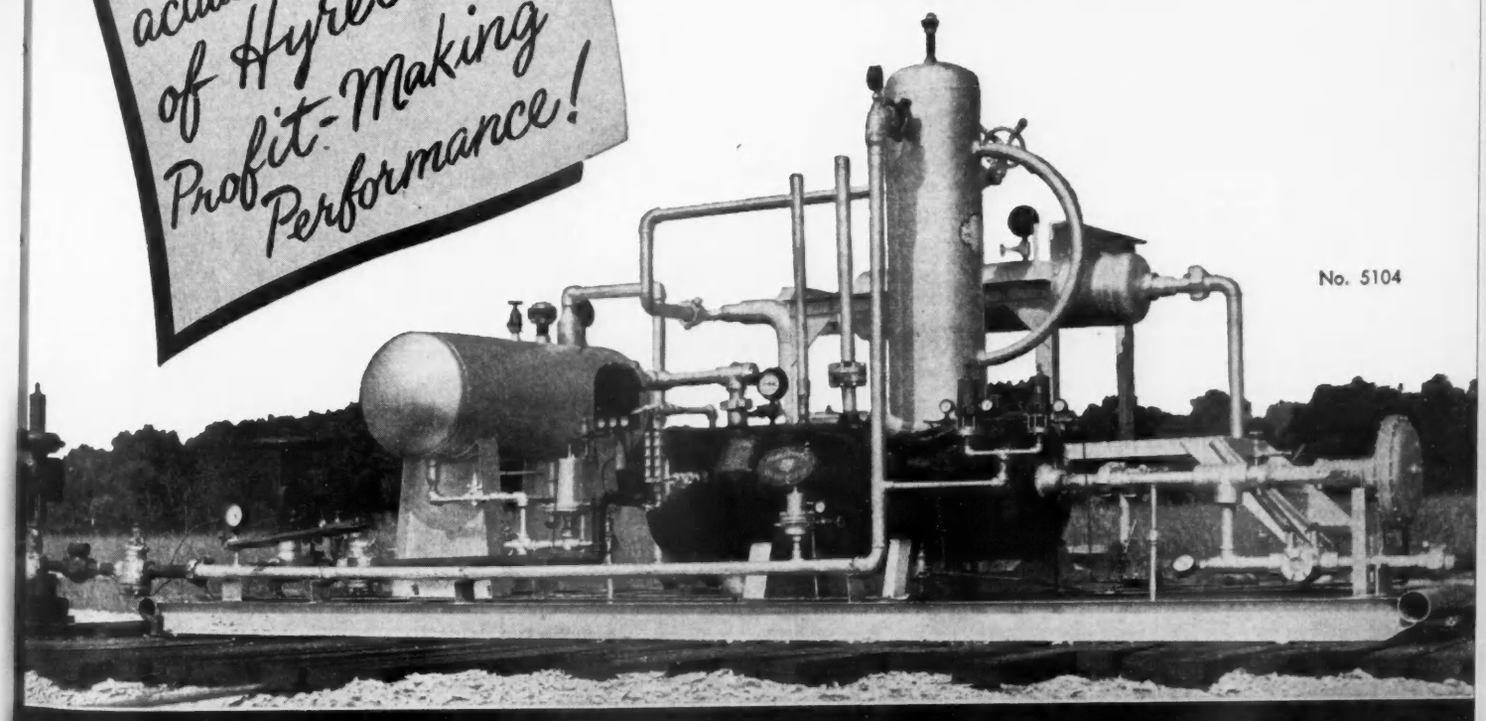

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Cut Ship-to-Shore Loading Time in Half!

You can save up to 50% of the time required for loading and unloading cargo with Monarch® Oil Suction and Discharge Hose!

Monarch is *smooth bore*—an original Hewitt-Robins development. Its oil-resistant, smooth tube cuts friction to a minimum. It drains clean because there is no flow-retarding internal spiral wire commonly used in rough-bore hose.

But that's not all. Another exclusive Hewitt-Robins development "welds" tube permanently to carcass . . . *it can't pull loose!* Nipples are integrally built into the hose and special Durabond process insures tube-to-metal adhesion . . . *stops leakage at nipples!*

Hewitt-Robins Monarch Oil Suction and Discharge Hose is lighter in weight . . . easier to handle than ordinary rough bore hose. Multiple plies of specially woven, high-tensile duck give it strength and flexibility to withstand the strain of all loading and unloading services.

This is but one of many Hewitt-Robins hoses specially engineered for the oil industry. For complete information call your Hewitt Rubber distributor (listed under "Rubber Products" in the classified 'phone book), or write Hewitt Rubber Division, 240 Kensington Ave., Buffalo 5, New York.

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bons Law, the concessionaires are obligated to execute all operations of exploration, exploitation, manufacture or refining and transportation while adhering to the technical principles applicable; to exercise due care in order to avoid any loss of the substances produced; and to execute operations in such manner as to avoid waste of those substances In this regard, the concessionaires shall be responsible for the damages caused the nation or third parties. To enforce MER and other standard regulations pertaining (to) this matter, a Conservation Department functions under the Technical Office of Hydrocarbon in the Ministry of Mines and Hydrocarbons.

Q. *Is the Venezuelan oil industry faced with any immediate or prospective shortages which are likely to affect continued high crude production?*

A. Lack of steel equipment is likely to affect continued high crude production in Venezuela.

Q. *Are laws controlling Venezuela oil, natural gas and other industries designed to protect old companies' investments and concessions? Or are new firms, both native and foreign, being sought by the Venezuelan government?*

A. Persons or companies, either Venezuelan or foreign, that are legally competent to assume obligations, may acquire oil or gas concessions. The Federal Executive has discretionary power in the granting of concessions and all responsible operation companies are welcomed in my country.

Q. *What was the purpose of your visit to Texas?*

A. The purpose of my visit to Texas was to be acquainted with the people and government of this great state, as well as to get a personal impression of the huge oil and gas industries which had been developed there.

Q. *What is your opinion of the petroleum and industrial centers which you visited in Texas?*

A. I was amazed at the striking similarities between the Lone Star State and my country, both blessed with rich natural resources and inhabited by people of common aspirations. It was very gratifying to note that the high development achieved by the oil and gas industries in Texas is reflected in the amount of taxes by those industries to support increasing education and government costs. The rise of Texas to leadership in oil production is also reflected in the fine job carried out by the Railroad Commission to prevent waste in the development of oil and gas resources.

January 18, 1907 OIL INVESTOR'S JOURNAL

BEAUMONT IRON WORKS, INC.

BEAUMONT, TEXAS

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We carry Boilers, Engines and Pumps in Stock both New and Second-Hand.

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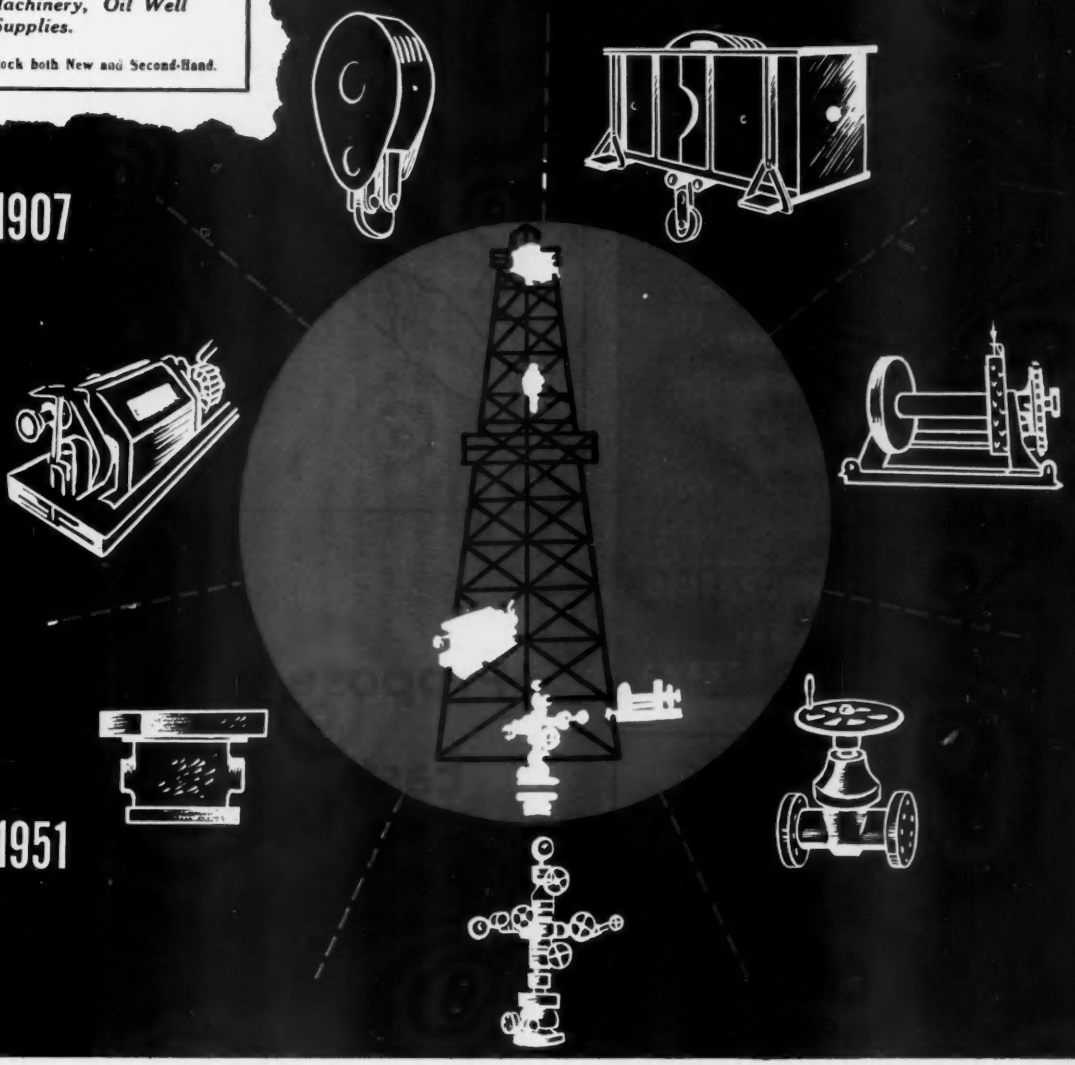

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BIW Rotary Drilling & Production Equipment
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Today—enriched by nearly a half century of experience—BIW continues to produce a wide variety of equipment including drawworks, crown and traveling blocks, wellhead assemblies, coring reels and other equipment of high quality design and fabrication.

A specialty product is the Atlas-Hughes non-lubricated valve for Christmas tree and other oilfield uses. For information on all BIW drilling and production equipment, get in touch with your nearest Atlas Engineering Works representative.

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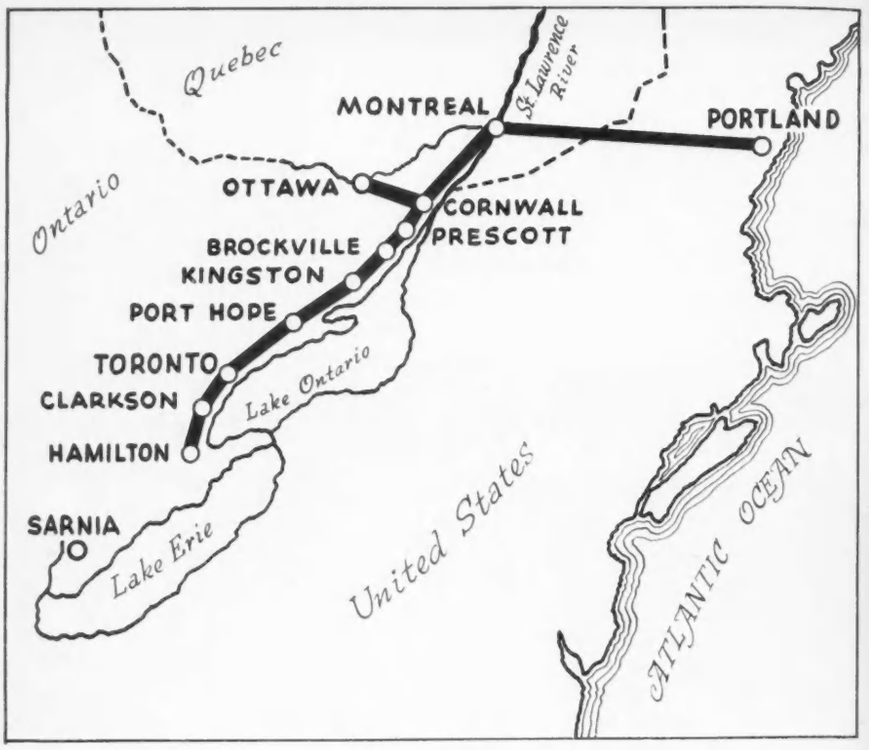

Proposed Line Would Link Eastern Canadian Cities

FOUR major eastern Canadian cities—Montreal, Ottawa, Toronto, and Hamilton—would be connected by a petroleum products pipe line under a plan which has been placed before Canada's Board of Transport Commissioners.

A. N. Horne, president of the newly formed Trans-Northern Pipe Line Company and formerly vice president and general manager of Trans-Arabian Pipe Line Company, said he hoped construction of the line would commence immediately upon the transport commissioners' approval, if granted.

Participants in the venture are the British American Oil Company, Ltd.; Shell Oil Company of Canada, Ltd.; and McColl-Frontenac Oil Company, Ltd.

The main ten-inch line, to be 100 miles long, will traverse the north shore of the St. Lawrence River and Lake Ontario. Terminals will be at Cornwall, Prescott, Brockville, Kingston, Port Hope, Toronto, Clarkson, and Hamilton. A six-inch, 44-mile line will serve Ottawa.

With a designed initial capacity of 40,000 barrels daily, the pipe line will transport finished products from the three participating companies' refineries at Montreal East. Most of the crude purchased to feed these refineries is transported to Montreal by pipe line from Portland, Maine, where where ocean tankers unload.

Horne said the projected intercity line would require less steel than that which would be needed if the tanker fleets and marine storage bases are expanded to serve the widening Canadian petroleum products market.

"Apart from the fact the new pipe line would conserve considerable steel now needed for defense purposes," Horne said, "it would be of inestimable value if by any chance a third world conflict is precipitated."

Even when the pipe line is completed, the growing demand for petroleum products will make necessary the utilization of existing tanker fleets to the fullest possible extent, Horne said.

"Spraberry Trend Fields"
Factual Data Reports
The reports contain field rules, well completion data, gas-oil ratio tests, bottom-hole pressure tests and monthly production by leases, companies and fields. All known Spraberry Areas are included. The initial report sells for $50 and brings all data up through 3-31-51. Monthly supplements at $12.50 each keeps the data up to date.
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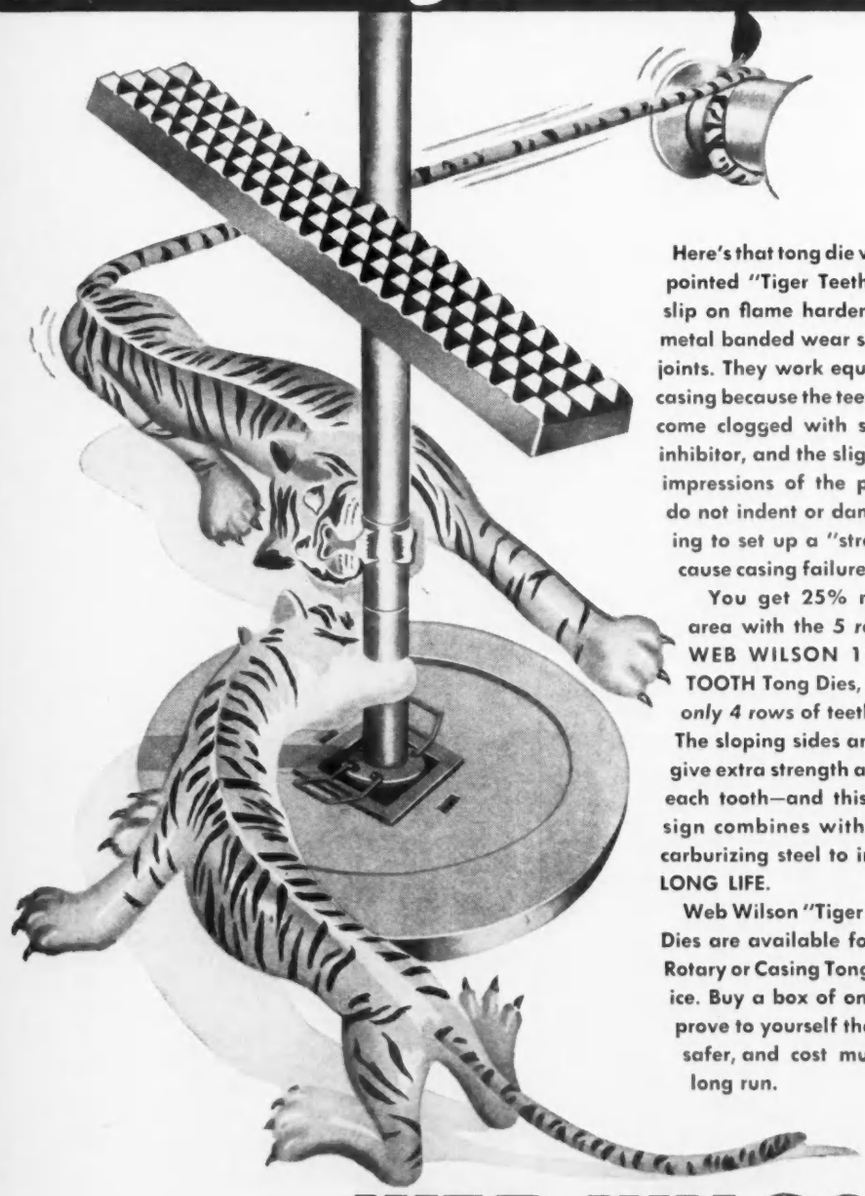
WEB WILSON *Tiger Tooth* TONG DIES

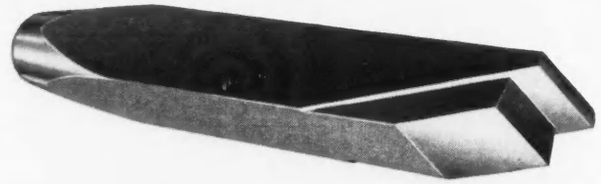


Here's that tong die with the sharp, pointed "Tiger Teeth" that won't slip on flame hardened, or hard-metal banded wear subs and tool joints. They work equally well on casing because the teeth do not become clogged with scale or rust inhibitor, and the slight, pin-point impressions of the pointed teeth do not indent or damage the casing to set up a "stress riser" and cause casing failure.

You get 25% more gripping area with the *5 rows of teeth* in WEB WILSON 1¼-inch TIGER TOOTH Tong Dies, compared with *only 4 rows* of teeth in other dies. The sloping sides and heavy base give extra strength and backing to each tooth—and this efficient design combines with high grade carburizing steel to insure EXTRA LONG LIFE.

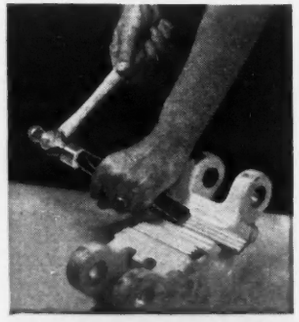
Web Wilson "Tiger Tooth" Tong Dies are available for use in any Rotary or Casing Tong now in service. Buy a box of one dozen, and prove to yourself that they are far safer, and cost much less in the long run.

I'M "JIFFY" THE TONG DIE DRIVER



I drive 'em, in and I drive 'em out! And the men who "knock" me most are my best friends. I put up a hard front to give years of service—But I'm softer in the rear end so you can hammer away without having any chips popping off to hit you in the eye—And my overhanging upper lip keeps any pieces of the die from flying around.

TONG MEN, listen a minute . . . Haven't you had enough of trying to drive tong dies in or out with a bolt or a cold chisel, or whatever was handy? Want to stop mashing fingers, and get away from those flying chips off hardened tong dies that can put out an eye or cut your hands or face like a razor? ★ Here's how we'll do it . . . I'm "Jiffy" and I came into this world for just one reason—to work with men like you to save you a lot of grief. You'll go for me on sight, and if your tong dies are 1 inch wide I'll work for years and years for only $7.50. If you are using 1¼ inch dies, make it $10.00. ★ You won't have any trouble getting the boss to buy me when he sees how I save time and money and accidents. In fact, he'll probably get "Jiffy" Twins just in case one of us gets misplaced somewhere. Ask him the next time he's on the rig—the name is "Jiffy."



P-S-S-T . . . let me whisper to you Safety Engineers. ★ If you really knew how I cut accident rates you would personally introduce me to *every* crew on *every* rig under your eagle eye. Crews *gladly* stop using bolts, cold chisels (or what have you?) when "Jiffy" comes on the job to install and remove tong dies. I keep chips or pieces from flying off hardened tong dies to injure eyes, hands or face, and I save a lot of mashed fingers. ★ Any Web Wilson man has "Jiffy" Tong Die Drivers in his car for immediate delivery—ask him!

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Iran the Loser?

HAS Iran nationalized its oil industry and halted crude and refinery production only to lose its markets and importance in world petroleum trade?

That it may have is based on three resulting factors which the Iran government apparently did not foresee:

- Areas formerly dependent on Iranian oil as their prime supply are getting along without it.
- Importance of this Middle East producer, which last year accounted for 6 percent of the world's total output, is diminishing daily.
- Iran is "holding the bag," with its idle industry awaiting a possible working agreement with Anglo-Iranian Oil Company, while its Middle Eastern neighbors are benefiting through increased production and probable assurances of higher royalties. For example, Iraq in mid-August reached an agreement with three operating companies for a 50-50 split in profits.

Loss of Iranian crude production, a daily average of 610,000 barrels in world markets, has been countered by significant increases elsewhere, particularly in the Middle East, and the effective redistribution of available world supply by the recently formed Foreign Petroleum Supply Committee, composed of 19 American companies with operations abroad. Organized early in July by the Petroleum Administration for Defense and given immunity from prosecution under U. S. antitrust laws and the Federal Trade Commission Act, FPSC has adopted a plan for cooperative action for increasing crude and refinery production abroad and for more efficient use of transportation and storage facilities in petroleum-short areas. Action taken by the committee has resulted in replacement from other sources of all but about 150,000 barrels daily of the deficit created by the end of export shipments from Iran in late June.

Increased production has accounted for only a minor share of the supply required to offset Iranian oil in the early stages of the committee's operation. The major part has been met through greater withdrawals from crude inventories in the Middle East and refined products in Europe and the Western Hemisphere and through diverting of Middle East oil shipments destined for the U. S. and Canada to European refineries. The latter supply amounts to 200,000 barrels daily, which will be replaced for the present by inventory withdrawals in the U. S. and Canada.

In anticipation of the possible loss of Iranian oil, leading world producers have built up above ground inventories of crude and refined products since early this year. While this

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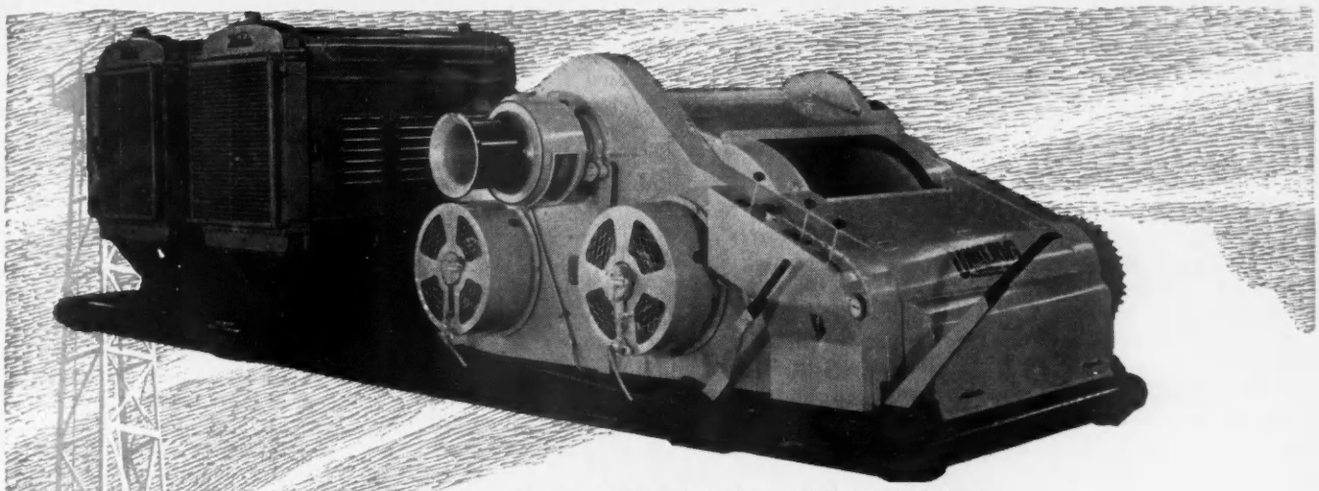

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*One set of clutches shows slight wear after 90,000' of drilling. To March, 1951 only one clutch failure —caused by low air pressure.

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supply is only a temporary method of alleviating the over-all deficit, committee members are optimistic these stocks will be ample to meet world demand until the recently proposed expanded world production programs are in full swing. These programs will be effected largely in crude oil production increases in the Middle East and Caribbean area and higher refinery output in Western Europe. In addition, PAD plans to keep state oil regulatory agencies in the U. S. fully informed of world petroleum supply-demand trends with the hope that increases in domestic production will be permitted if needed.

Western Europe and nations which added about 380,000 barrels daily to total refinery charging capacity in 1950, have programmed 1951 expansion at 287,000 barrels daily, some of which already is on stream. Another 500,000 barrels of capacity will be ready by the end of 1952. Crude production problems of Middle East concessionaires have been revised in recent weeks and sizable increases are anticipated in the remaining months of 1951 from most producing areas.

This year, these nations made substantial increases over 1950, with present Saudi Arabian output approaching 850,000 barrels daily and Kuwait just over the 600,000-barrel-a-day rate. Saudi Arabia last spring moved ahead of Iran as the region's leading producer.

The greater demand for Middle East oil, however, has brought on demands for substantial boosts in royalties from producing nations. Middle Eastern rulers have eyed the lucrative 50-50 profit split negotiated by Arabian American Oil Company and King Ibn Saud of Saudi Arabia last December and are pressing their claims for equal agreements by their concessionaries. Iraq was the first nation to receive a similar arrangement from its three concessionaries—Iraq Petroleum Company, Mosul Petroleum Company, and Basrah Petroleum Company. The finer points of this agreement with the companies — all of which have the same ownership: Anglo-Iranian, Compagnie Francais de Petroles, Royal Dutch-Shell and Near East Development Corporation (Standard Oil Company (N.J.) and Socony-Vacuum Oil Company, Inc.) each with a 23.75 percent interest and C. S. Gulbenkian, an individual with the remaining 5 percent — indicate Iraq has a possibly more advantageous deal than Saudi Arabia.

The Iraqi accord, retroactive to January 1, 1951, provides:

1. Iraq will receive 50 percent of profits to be deducted before foreign income taxes. (Saudi Arabia's 50 percent share comes after Aramco pays its U. S. income taxes.)

2. If future agreements between oil companies and neighboring Middle East countries increase oil royalties for the governments concerned, Iraq will have the right to ask for similar increases.

3. The companies will supply the proposed government refinery (a 24,000-barrel-a-day plant to be built by M. W. Kellogg for a reported $22,500,000) with crude necessary for local consumption at 10.3 cents a barrel.

4. Iraq will receive its compensation partly in crude and partly in cash, and the government will be free to sell part of the crude to any buyer and sell the remainder to the pact companies at world market prices.

5. Minimum production quotas averaging 450,000 barrels daily must be produced by Iraq Petroleum and Mosul starting in 1954 and the total output of IPC, Mosul and Basrah starting in 1955 must average 610,000 barrels daily.

It is expected the agreement will result in total royalties to Iraq in 1951 of $42 million, and increasing to at least $166,200,000 in 1955. A further provision says the nation will receive a minimum revenue of $14 million annually for two years should production be halted because of "force ma-

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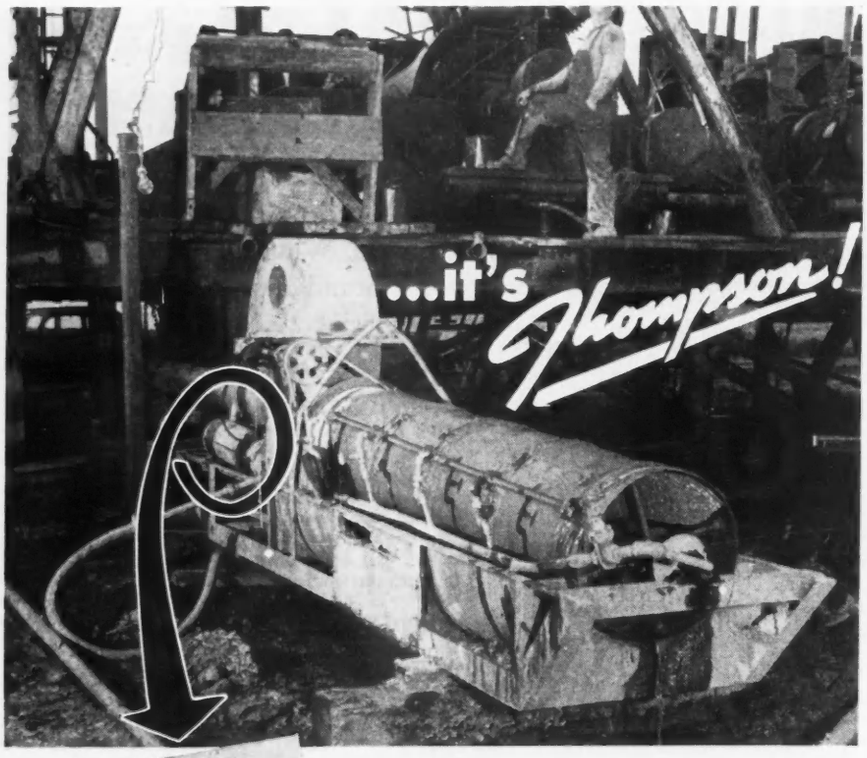

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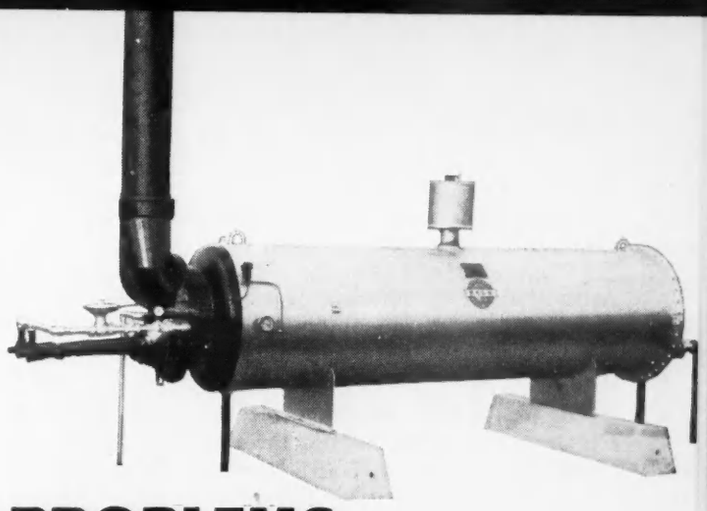

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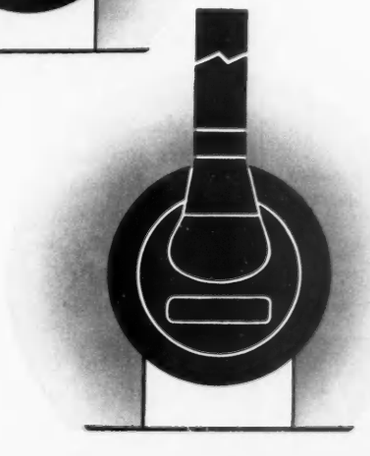

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Alberta Joint Venture Results in 675-Barrel Well

Three Alberta independent companies brought in their first joint well, the Wagner - Matlo - Dillabough - Ad Astra 3, in the Campbell area several miles northeast of Edmonton and two miles northeast of the Campbell Cretaceous oil pool.

The well initially produced 71 barrels of oil in a 2½-hour test through 12/64-inch choke—an hourly rate of 28 barrels and daily rate of approximately 675 barrels.

The well was drilled by Wagner Oils, Ltd., and Matlo Oils, Ltd., of Calgary, under agreement with Ad Astral Minerals, Ltd., of Edmonton, owner of the 320-acre lease involved.

Arabian Field Found

Saudi Arabia's ninth oil field has been discovered offshore in the Persian Gulf. Final completion on the well, about 13 miles south of the port of Ras El Mishaab and about 12,000 feet offshore, had not been made; however, on a drill-stem test the well flowed sweet oil of medium gravity.

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Harmful Effects of Italian Monopoly Law Discounted

Fears that a proposed Italian oil monopoly law will work great hardships on foreign operations were discounted by Harry MacMillan of MacMillan Petroleum Company, Los Angeles, after eight months of prospecting in the Sicilian oil fields

The proposed law, approved by the Italian cabinet but awaiting parliamentary action, places all oil operations in the Po valley, as well as any oil fields which may later be discovered, under jurisdiction of a new government agency.

A government spokesman said the law will safeguard the interests of foreign companies, which will be free to continue exploration under sublicenses from the new agency, instead of under direct licenses from the government. He said the law would not change the status of foreign companies outside the Po valley and that each company would be examined separately and that every effort would be made to find a solution satisfactory to all interested firms

MacMillan, who has spent much time since 1948 in Italy and Sicily as director of foreign operations for the MacMillan company, said he feels "that in view of the present uncertainty of oil development in foreign lands and the apparent unstable leases, agreements and contracts under which many companies are operating outside of the U. S., the proposed Italian law is not so fearful.

"When we consider," he said "that companies are re-arranging their work in contracts with a number of countries, even to the point of almost an even division in monies received, it would appear that operating in Italy under sublicensing might not be too exacting. In other words, this new monopolistic organization of Italy should set up a plan whereby the intelligent developments should proceed and a share of reasonable proportions should be assessed, then the entry into Italy by capital from the States should not be so burdensome."

MacMillan pointed out that a few years ago Sicily was saddled with the present Italian law and, being an autonomous state, promulgated a new law covering the development of petrol within its boundaries

On June 16, the Gazzetta Officiale of Sicily published the decrees authorized by the government which concluded negotiations of three companies for permits after many months of endeavor.

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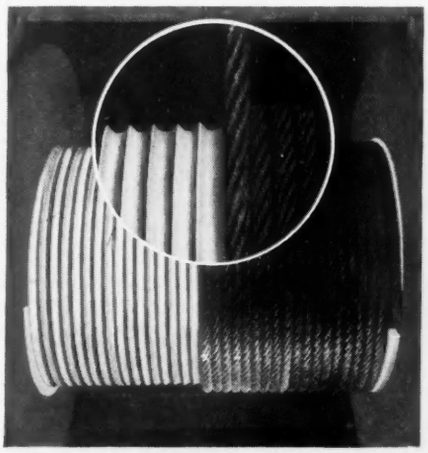
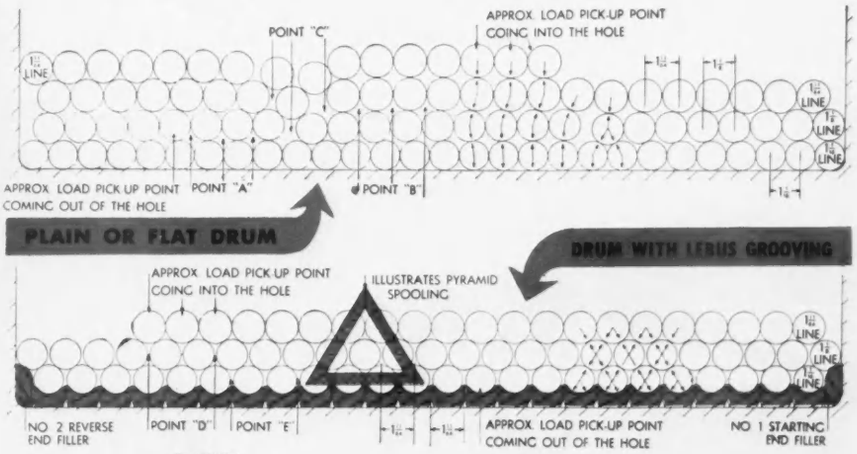


This photograph and insert is a drawworks drum with the LeBus Wire Line Grooving and Spooling System installed and with the first layer of line wrapped to the preferred pick-up point when coming out of hole to change bits.

Theoretical illustration of the Spooling of a Tapered or Stretched 1⅛" Wire Line. A.P.I. Tolerance 1⅛ + 1/64 or − 0 Diameter.

This print illustrates that less line is required on a LeBus grooved drum than on a plain drum, when the pipe has been picked up to the required height for making connections.


POINT "C"
APPROX. LOAD PICK-UP POINT COMING INTO THE HOLE
APPROX. LOAD PICK UP POINT COMING OUT OF THE HOLE
POINT "A"
POINT "B"
PLAIN OR FLAT DRUM
DRUM WITH LEBUS GROOVING
APPROX. LOAD PICK-UP POINT COMING INTO THE HOLE
ILLUSTRATES PYRAMID SPOOLING
NO. 2 REVERSE END FILLER
POINT "D"
POINT "E"
APPROX. LOAD PICK-UP POINT COMING OUT OF THE HOLE
NO. 1 STARTING END FILLER

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jeure." The previous royalty requirement in Iraq, negotiated in 1950 for a four-year period, called for a payment of 36 cents a barrel on oil produced and exported.

The spread of higher royalties to Iraq increases the chances of a similar financial arrangement in Kuwait, where the shiekh currently receives a royalty of 10 cents a barrel from Kuwait Oil Company, jointly owned by Anglo-Iranian and Gulf Oil Corporation, and in Bahrein, where the ante is 40 cents a barrel. Bahrein's concessionaire is Bahrein Petroleum Company, a jointly owned holding of Standard Oil Company of California and The Texas Company.

The agreement in Iraq paves the way for IPC to continue its construction program of new pipe line outlets from the Kirkuk field to the Mediterranean and to the Persian Gulf. Total production by the start of 1953 with both the Kirkuk-Banias 560-mile line and the Zubair-Fao, on the Persian Gulf, line in operation is expected to be in the neighborhood of 600,000 barrels daily. Current production is limited to 180,000 barrels a day, the capacity of the Kirkuk to Tripoli 12 and 16-inch line.

While the expanding crude producing and refining facilities eventually will more than offset the loss of Iranian oil, foreign observers still hope for a possible satisfactory agreement to be reached between Iran and the British government although mediation talks were broken off again late in August. Royalty payments by Anglo-Iranian to Iran (see Table 1) have in past years contributed substantially to the near-bankrupt government, reaching a peak of $92.4 million in 1950, or more than one-third of the nation's budget, estimated at $255 million. Iran needs revenues from its oil resources and the loss of these revenues already has seriously damaged the nation's economy. Iran's attempt to sell oil on the open market has met with failure so far, and even should buyers agree to take this oil, once the Abadan refinery's tank farm is emptied (estimated filled to 14 million barrels of capacity at the beginning of August) the politically-shattered nation could not possibly operate the giant refinery for any length of time. This prediction has been voiced despite the fact that Iranians constituted 70,628 of the 75,148 employes in the Iranian industry (see Table 2) as of last March. Approximately two-thirds of the Iranians on the payroll were refinery personnel, with the remainder in the producing areas and other installations. Iranians also held 30 of the 89 top-management positions.

TABLE 1
Payments to Iran by Anglo-Iranian Oil Company
(In Millions of Dollars)

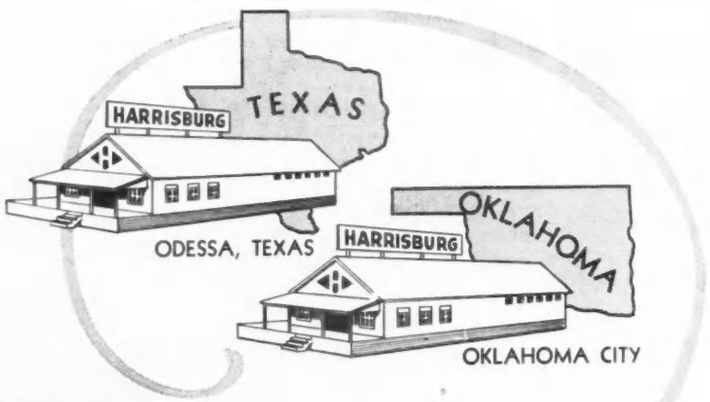
Form of Payment	1947	1948	1949	1950
Royalties paid under 1933 Agreement	$19.8	$25.7	$37.8	$44.8
Other financial benefits, taxes, etc., (est.)	22.4	28.0	35.0	47.6
Total amount paid	42.3	53.7	72.8	92.4
Additional sums payable under 1949 agreement (not ratified by Iran)	14.0 *	26.6 *	26.3	25.2
Total	56.3	80.3	99.1	117.6

* Retroactive payments.
Source: British Economic Record (Published by British Information Service).

TABLE 2
Anglo-Iranian Oil Company Personnel in Iran
(As of March, 1951)

Employment Category	Iranian	*Non-Iranian	Total
Staff:			
Senior	30	89	119
Other	5,492	3,534	9,026
Labor:			
Top Grade	17,550	896	18,446
Middle Grade	12,225	1	12,226
Lower Grade	4,411	0	4,411
Unskilled	13,925	0	13,925
Apprentices and Trainees	3,392	0	3,392
Contractors' Employees	13,603	0	13,603
GRAND TOTAL	70,628	4,520	75,148

* Includes British, Indian apd Pakistani.
Source: Anglo-Iranian Oil Company.



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INCORPORATED ESTABLISHED 1836

Empresa Takes Over De Mares Concession

THE De Mares concession, Colombia's oldest and largest oil producing region, last month passed into control of government-owned Empresa Colombiana de Petroleos at the expiration of International Petroleum Company, Ltd's., 30-year exploration and development title. Under the concession terms, all producing facilities operated by the company's subsidiary, Tropical Oil Company, as well as the Barrancabermeja refinery, reverted to Empresa at no cost to the state.

In a move to satisfy the international interest exhibited as well as Colombian needs, Empresa contracted with International, an affiliate of Standard Oil Company (N. J.) to provide technical assistance on a cost-plus basis in the producing operations of the concession for a maximum of five years (WORLD OIL, August, 1951). Total direct cost to Colombia for International's staff advice on operating procedure is expected to amount to less than $500,000 annually, plus an additional 20 percent of these charges to cover administration expenses incurred by International incident to maintaining its staff in the field.

Empresa has leased International's 22,000-barrel daily capacity Barrancabermeja refinery to the latter for a ten-year period which commences with the date of completion of a proposed expansion program of the government company to construct a complete plant and boost charging capacity to 35,000 barrels daily. International will pay operating costs of the refinery and will pay Empresa an annual rental plus additional fees based on throughput for use of the facilities.

Empresa's chief objective in its operation of the concession is to meet domestic petroleum needs. Present output of the area is approximately 41,000 barrels daily, about 40 percent of the nation's total production. This compares with production of 38,981 barrels daily at the end of 1950, which represented an increase of 4000 barrels a day over 1949.

The four fields of the concession—Infantas, La Cira, Galan and Colorado—have 1018 producing wells, comprising 18,700 proven acres of the De Mares total of 1,280,000 acres. The concession is in Santander department, stretching for 70 miles along the Magdalena river with an average depth of 30 miles. Cumulative production from the concession, which dates back to 1916 as a continuous producer, totaled 406,677,000 barrels through 1950 and estimated recoverable remaining reserves of 125 million barrels without initiating secondary recovery methods.

An early objective of Empresa is the proposed refinery construction program which calls for a crude pipe still, vis-breaker, fluid catalytic cracker, light ends recovery unit, aviation alkylation unit and other additions and improvements. These facilities will cost an estimated $20 million, of which International has agreed to lend the new company $10 million to be repaid over a ten-year period.

U. S. consultants to Empresa estimate the new refining facilities can be ready for operation within 2½ years, assuming required materials will be available.

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In West Texas and New Mexico, Mid-Continent Supply Company has consistently expanded its stores and services to assure a readily available source of the finest in equipment and supplies to meet any oil-field requirement. You'll find these Mid-Continent stores operating "Around-the-Clock" . . . and staffed by experienced men who have the "know-how" to give you unexcelled specialized service. Make these stores, topped by the familiar blue neon oil-spouting derrick, your supply headquarters.

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BOWIE, TEXAS
BROWNFIELD, TEXAS
CASPER, WYOMING
DUNCAN, OKLAHOMA
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Of World Oil Men

CECIL V. HAGEN of Houston has been elected president of Canada Southern Oils, Ltd., which was recently formed to take over the Canadian and Ecuadorian interests of Pancoastal Oil Company, C. A.

A veteran of 21 years in the oil industry, Hagen was formerly chief geologist in charge of exploration for Superior Oil Company of California, and now operates his own geological consulting firm. In this connection, he has been associated with geological studies in Colombia, Venezuela, Ecuador, Trinidad, Cuba, and Canada, as well as in the U. S.

DR. S. K. CHAKRAVORTY, who has been engaged in geological survey work in India, U. S. and Canada, has been appointed principal geologist for the Department of Natural Resources, Province of Saskatchewan, Canada.

Dr. Chakravorty will be in charge of the newly established petroleum Geology and Engineering division of the Mineral Resources Branch, activities of which include administration of conservation regulations and practices in connection with exploratory drilling, production of oil and gas, and geological studies of the sedimentary areas of Saskatchewan.

Resources Minister J. H. Brockelbank said Dr. Chakravorty's position was created as a result of the wide increase in oil exploration and in the production of the Lloydminster field.

Houston Nomads initiated nine new members at their August outing at which a golf tournament was held. The new members are (standing, left to right), B. H. Pickard, Tom Herndon, J. D. Thornton, A. C. Oden, J. T. Tucker, Ed L. Hannon, Jr., Gail O. Carroll, R. J. Munn, and J. A. Tennant, Jr. The initiators kneeling are H. Ben Young, Larry J. Kelley, Harry E. Estes, and Fred Christanelli.

INTERNATIONAL Petroleum Company, Ltd., has elected Henry B. Wilson, Jr., to the board of directors. Wilson has been assistant manager of the Employe Relations department of Standard Oil Company (N. J.) with which International is affiliated, since September, 1948.

Henry B. Wilson, Jr.

A 1929 graduate of the University of Oklahoma with a degree in petroleum engineering, Wilson started as a student engineer with Humble Oil & Refining Company. He served in various positions in the Producing and Employe Relations departments with Humble until 1936, at which time he was transferred to Buenos Aires with Standard Oil Company, S. A. Argentina, as employe relations manager. In 1939 he was transferred to the Standard Oil Company of Venezuela in a similar capacity. He entered the employe relations department of Jersey Standard in 1941.

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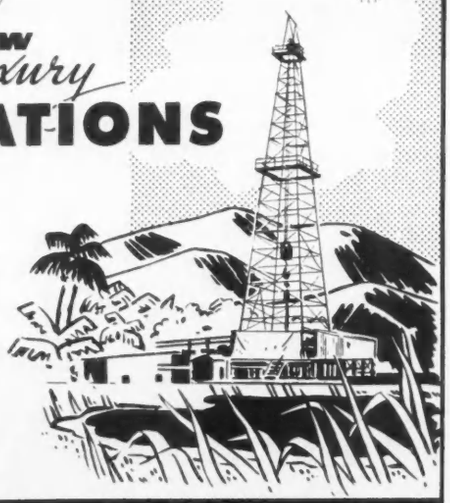

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● *672,000 new net tons of steel per year*—that's the goal of Republic's latest $75,000,000 expansion program in the Cleveland district.

But, making steel *takes* steel . . . many, many tons. For example, Republic must "plant" more than 1,194,000 feet of 10¾" Electric Weld pipe. This pipe will serve as piling driven 110 feet into the earth to support four new 275-ton open hearth furnaces. More steel must be diverted to the construction of a new blast furnace, coke ovens, a reducing mill and soaking pits.

This program is a major part of Republic's share in expanding the nation's annual steel production potential to 117,500,000 tons by late 1952. First steel from these facilities is scheduled to be poured early next year. This means more steel for defense, and for all products of American industry.

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REPUBLIC STEEL ®

Other Republic Products include Line Pipe—Carbon, Alloy and Stainless Steels—Upson Studs, Bolts and Nuts—Electrunite Heat Exchanger Tubes

M. A. WRIGHT has been elected executive vice president of International Petroleum Company, Ltd. Wright has been deputy coordinator of all producing activities of Standard Oil Company (N.J.) since November, 1949.

Born in Blair, Okla., April 9, 1911, he was graduated from Oklahoma A. & M. College in 1933 with a degree in civil engineering. Wright started his oil career as a junior engineer for The Carter Oil Company in the Seminole field of Oklahoma. Serving in various engineering positions in Oklahoma and Louisiana for Carter, he was advanced to chief petroleum engineer in 1943 and assistant manager of the production department the following year.

J. R. McWilliams

M. A. Wright

Early in 1946, Wright was appointed an executive assistant in the producing coordination department of Jersey Standard.

J. R. McWilliams, formerly executive vice president and a director of Carter has been named to succeed Wright as deputy coordinator of Jersey's world-wide producing operations. A graduate of the University of Michigan, McWilliams joined Carter in 1934 and two years later was elected vice president of Standard Oil Company of Louisiana. He rejoined Carter as a director and manager of the production department in 1941, and in 1944 was elected a vice president. While on a year's leave of absence during 1945, he served as director of the producing division of PAW.

CLYDE S. DEAL, Phillips Oil Company geologist at Caracas, Venezuela, has resigned to join DeGolyer & MacNaughton as geologist with headquarters in Rio de Janeiro, Brazil.

OTTO S. KRAMER, with The Carter Oil Company's Geophysical department, Tulsa, has been transferred to Venezuela as assistant seismograph operator for Creole Petroleum Corporation.

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Branches throughout Canada's oil-rich western plains. On-the-spot information available through J. C. Mayne, Supervisor, Calgary, Alberta, or Head Office, Montreal

We do not provide information on oil securities

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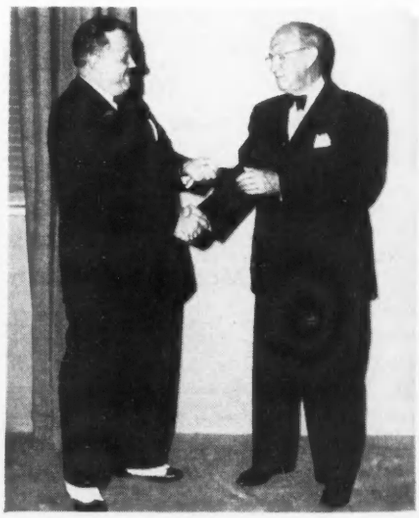
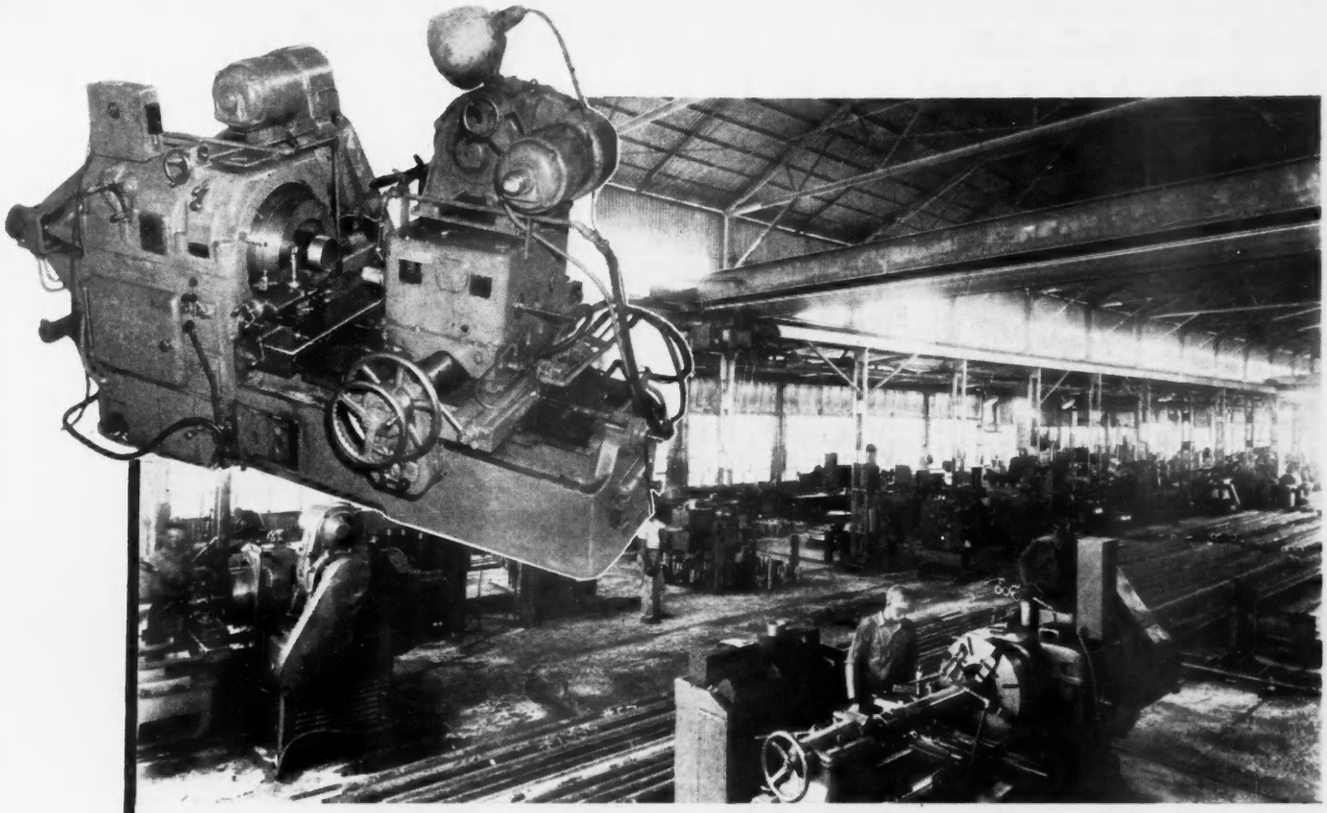


Lifetime Nomads membership card is presented Clarence A. McClelland, who recently retired from International Derrick and Equipment Company of Dallas, by Courtney J. Berlin, president, Dallas-Fort Worth Chapter Nomads.



Pictured above is our No. 30 M B Smalley, Twin Spindle, Thread Miller — unexcelled for precision threading. Pictured also is a portion of our modern plant, featuring the best in equipment and skilled personnel.

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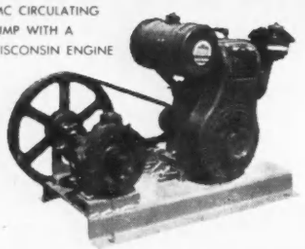

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Men in the Industry NEWS

Earl A. Brown has been appointed general counsel of Magnolia Petroleum Company and Magnolia Pipe Line Company to succeed the late **Walace Hawkins.**

Earl A. Brown

A 1914 graduate of the University of Texas Law School, Brown in 1925 joined a law firm in Ardmore, Okla., that represented Magnolia in southern Oklahoma. In 1936 he joined the company's legal staff at Oklahoma City. After three years there, Brown was transferred to Magnolia's general offices in Dallas as assistant general counsel.

•

R. D. White, formerly division exploration superintendent of the Western division at Denver, has been appointed division exploration superintendent of the new Southeastern division of The California Company, and will have headquarters in Shreveport. **Paul Mackey,** formerly division landman for the Southern division in New Orleans, was named to a similar post in the new division.

L. I. Brown was named manager—geology in New Orleans on the staff of the vice president — exploration. **T. C. Nugent** was appointed manager — land in New Orleans, and **N. J. Smith** was made chief evaluations geologist.

C. H. Ramsden, assistant division superintendent of the Western Exploration division, has been made Western division superintendent, headquarters remaining at Denver. **E. F. Raftery** has been named division landman for the Western division. **J. H. Ware** was made district landman for the Plains States district, replacing Raftery. **R. W. Killen** was named division leaser for the Western division and **E. S. Godwin-Austen** was appointed district landman for the Colorado-Utah-Arizona district, headquartered at Grand Junction, Colo., replacing Killen.

Other appointments include those of **H. L. Heiple** as assistant manager — land, New Orleans; **M. A. Betts,** title superintendent; **A. L. Morgan,** Southern division geologist; **D. G. Couvillon,** Southern division landman; **R. I. Levorsen,** West Louisiana district exploration superintendent; **J. W. Desmond,** West Louisiana district landman; **J. J. Courere,** East Louisiana district exploration superintendent; **R. E. Bounds,** East Louisiana district landman; **C. S. Reily,** North Louisiana-South Arkansas district landman, Shreveport; and **E. M. Deterly,** Mid-Continent division landman, Ardmore, Okla.

•

Everett C. Coville has been appointed division material man of the Rocky Mountain Producing division of The Pure Oil Company to succeed the late J. S. Baker. Coville has been employed by Pure since 1926 in Material department positions in the Southwestern Producing division, and more recently in the Texas Producing division.

•

Page Hufty, chairman of the investment Committee and director of The Equity Corporation, has been elected a director of The North Central Texas Oil Company, to succeed **Augustus C. Smith,** resigned.

•

J. Edgar Heston has been appointed manager of oil production for Cities Service Company, succeeding **Warren A. Sinsheimer** who was appointed petroleum economics coordinator for the company. **Maynard I. Landa** has been named associate petroleum economics coordinator.

Heston was graduated from Oklahoma University in 1931, and since that time has filled various key positions in geological and oil production departments of Cities Service companies. From 1941 to 1945, he was assistant director of production for PAW, and after that was assistant manager of the Oil Production department of Petroleum Advisers, Inc.

Landa, an engineering graduate of Texas A. & M. College, joined Cities Service as a junior engineer in 1919. Since 1941 he has been in the New York headquarters office handling special analyses studies of petroleum operations.

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Mercantile Securities Bldg. Dallas 1, Texas
Telephone: RANDOLPH 2419
Financing
Write for information about our new oil loan plan

Out in Front

$13,051,022 more in written premiums for 1950 than the nearest competitor. This chart, shown in millions of dollars, is based on figures furnished by the Texas Board of Insurance Commissioners. It graphically compares the premium of the ten principal writers of Workmen's Compensation in Texas last year. According to these figures, Texas Employers' Insurance Association wrote $15,336,991, over one-fourth of all Workmen's Compensation premiums for the year, in competition with some 130 companies.

THERE IS A REASON!

Why so popular? — Two principal reasons: SERVICE-SAVINGS. Service means specialized underwriting, claims and safety engineering. Service also means the rate reductions Texas Employers' advocated for ALL employers in Texas, resulting in savings for you.

SAVINGS

Texas Employers' net cost plan of operating has enabled it to save over $29,000,000 for Texas policyholders in dividends and guaranteed cost discounts, $3,018,855 for 1950 alone.

The Association now serves over 7,000 Texas business and industrial firms in their Workmen's Compensation needs. If you are not now taking advantage of our plan of insurance, then investigate what we can do for you.

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Largest Writer of WORKMEN'S COMPENSATION INSURANCE *in Texas*

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PORT ARTHUR • SAN ANGELO • SAN ANTONIO • SHERMAN • TYLER • WACO • WICHITA FALLS

TEXAS EMPLOYERS INSURANCE ASSOCIATION
HOME OFFICE - DALLAS, TEXAS

T. B. Hickman has been named manager of the Crude Oil Purchasing department, Southern division, and **J. W. Pyron** has been named special representative of the department for Gulf Oil Corporation and Gulf Refining Company.

Hickman will be in charge of crude purchasing, sales and exchange activities in Texas, Louisiana, Arkansas, Mississippi, Alabama and New Mexico. His headquarters are in Houston.

Pyron will have primary charge of crude purchasing sales and exchange in North Texas, West Texas, and New Mexico. His offices are in Fort Worth.

Walter H. Aldridge has been elected chairman of the board of Texas Gulf Sulphur Company. **Fred M. Nelson** was named president, and **Thomas S. Lamont** was elected chairman of the newly-formed Executive Committee. Other members of the committee are **Erle V. Daveler** and **Lowell C. Wadmond.**

•

Harrison T. Brundage, former geologist with Stanolind Oil and Gas Company, San Antonio, has been appointed a member of the staff of the Production division of Petroleum Administration for Defense.

Mose D. Hodges

William Hurst

William Hurst has become a partner and **Mose D. Hodges** an associate partner with **E. O. Bennett, James C. Lewis** and **David G. Hawthorn** in the firm of Petroleum Consultants, Houston.

Hurst received a B.S. in chemical engineering from M.I.T. in 1928, and a master's degree in the school of Applied Chemical Engineering in 1929. He joined Humble Oil & Refining Company where his work in reservoir engineering included a fundamental study of the East Texas field. He was senior reservoir engineer for Shell Oil Company from 1943 to 1948, engaged in the application and development of reservoir performance, gas cycling, secondary recovery and the interpretation of bottom hole pressure behavior of flowing wells. Since 1948 he has had a private reservoir engineering practice.

Hodges, a graduate of Rice Institute, first went to work for Marland Oil Company and remained with Continental Oil Company after the merger of the two companies. For 12 years he was a division engineer in Oklahoma, Kansas and Louisiana. He was then drilling superintendent for Felmont Corporation and Atlatl Royalty Corporation for three years and afterwards was with Sanderson and Porter for a short time, working on the design and construction of an oil pipe line from Kilgore to Texas City. He was production superintendent for Glassell and Glassell in Louisiana at the time he entered service in 1943. After his discharge he joined Petroleum Consultants as petroleum engineer.

•

J. E. Swearingen has been appointed general manager of production of Standard Oil Company (Indiana) at Chicago. He has been a director and assistant to the executive vice president of Stanolind Oil and Gas Company at Tulsa.

Five men have been promoted on the research staff. They are **R. F. Marschner,** senior research associate; **B. L. Evering,** research associate; **A. P. Lien,** section leader; and **D. R. Carmody** and **C. E. Johnson,** group leaders. All are at Standard's Whiting, Ind., research laboratory.

Swearingen joined Standard of Indiana in 1939 as a chemical engineer in the Research Department at Whiting. After holding several positions in that department, he was transferred in 1947 to the Manufacturing department of Stanolind Oil and Gas Company. He was made assistant to the vice president in charge of operations in 1949 and, subsequently, became manager of Stanolind's Central division with headquarters at Oklahoma City. Early this year he was transferred to Stanolind's general office in Tulsa and soon thereafter was elected a director of Stanolind Oil and Gas Company.

ROLO WELLCHECKERS

SKID AND TRAILER MOUNTED OIL AND GAS SEPARATORS

Field installation of trailer-mounted Rolo Wellchecker No. 1H-2406

Made in various sizes to fit any operation, Rolo Wellcheckers are shipped completely piped and ready to operate. You need only connect inlet and outlet. In addition to oil meter, B. S. & W. sampler, gas run, orifice meter, fittings and all controls, free water knockout with meter can be furnished to separate and continuously remove free water from well fluid. See Composite Catalog or write for illustrated Bulletin 1951-W.

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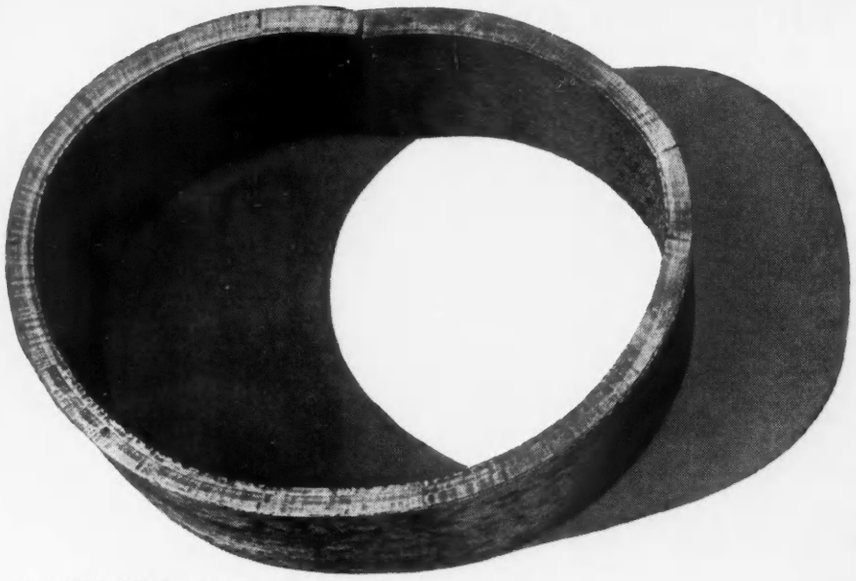
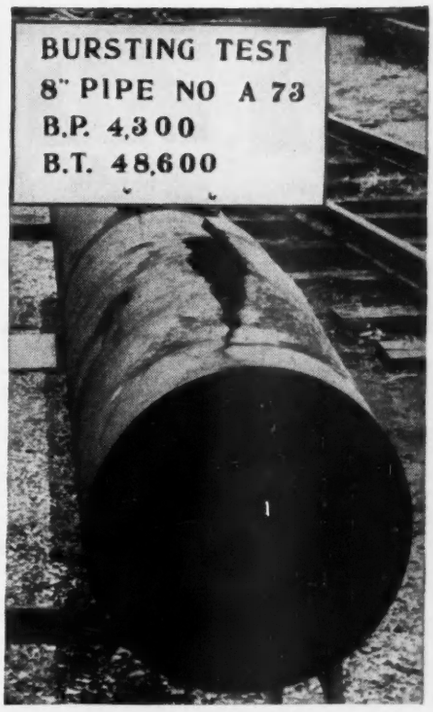


CRUSHING TEST: Ductile iron pipe sections, tested to fracture in compression, reveal the superior ductility of this new engineering material. Its strength and toughness make ductile iron an excellent material for tubular products. The average ring modulus of rupture on 8" diameter rings so tested by Underwriters Laboratories was 127,650 p.s.i. Photographs shown here were furnished by Lynchburg Foundry Company, Lynchburg, Va.



BURSTING TEST: This 8" diameter pipe was cast in ductile iron, welded with Ni-Rod 55® (nickel welding rod developed for cast iron) and then subjected to bursting tests. Average internal bursting pressure: 4,300 lbs. Average bursting tensile strength: 48,600 p.s.i. All cracks occurred outside of the weld, with no shattering.

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G. I. McFerron

Roy H. Mason

H. L. Hendry

J. P. Foraker

Jack A. Grigg

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Harrisburg 8, Pennsylvania

M. W. Sherwin has been promoted to chief geologist for Sohio Petroleum Company, replacing **Walter Johnson**, who will devote his time to special staff work for the company. **George I. McFerron** has been named to succeed Sherwin as Southern division geologist. Sherwin and McFerron will have offices at 1964 West Gray, Houston.

Roy H. Mason has been named district landman for the Oklahoma district. Other district landmen appointed are **Haygood L. Hendry**, Shreveport district; **J. P. Foraker**, Lafayette district; and **Jack A. Grigg**, Kansas district. **Raymond E. Thomas** was named land and titleman for the Julesburg Basin area in the Casper, Wyo., district.

Sherwin, a graduate of St. John's University, Toledo, Ohio, with an A.B. degree, did graduate work at Oklahoma University, where he was awarded both a B.S. and master's degree in geology. He joined Sohio in 1943 as a geologist in the Shreveport office, and since 1949 has been division geologist for the Southern division at Houston.

McFerron is a graduate of the University of Oklahoma, where he received an A.B. in geology. Following his graduation he joined Adams Oil & Gas Company, and joined Sohio as district geologist in Houston in 1945.

Mason, whose offices are in the First National Bank Building, Oklahoma City, joined Sohio as a law clerk in the Crude Oil Purchasing division in Mt. Vernon, Ill., in 1941.

Hendry has been with Sohio since 1948, when he entered the Record section in the Houston district land offices. His new headquarters are in the Atlas Building, Shreveport.

District landman in the Oklahoma district since 1948, Foraker's new offices will be in the Ostrich Building, Lafayette.

Grigg's headquarters are in the Bitting Building, Wichita. He joined Sohio in 1943 as a scout in the Pipe Line department in Illinois.

Thomas' headquarters will be at the Sohio office, 631 North Third Street, Sterling, Colo. He joined Sohio in 1948 as a scout in the Abilene, Texas, district.

•

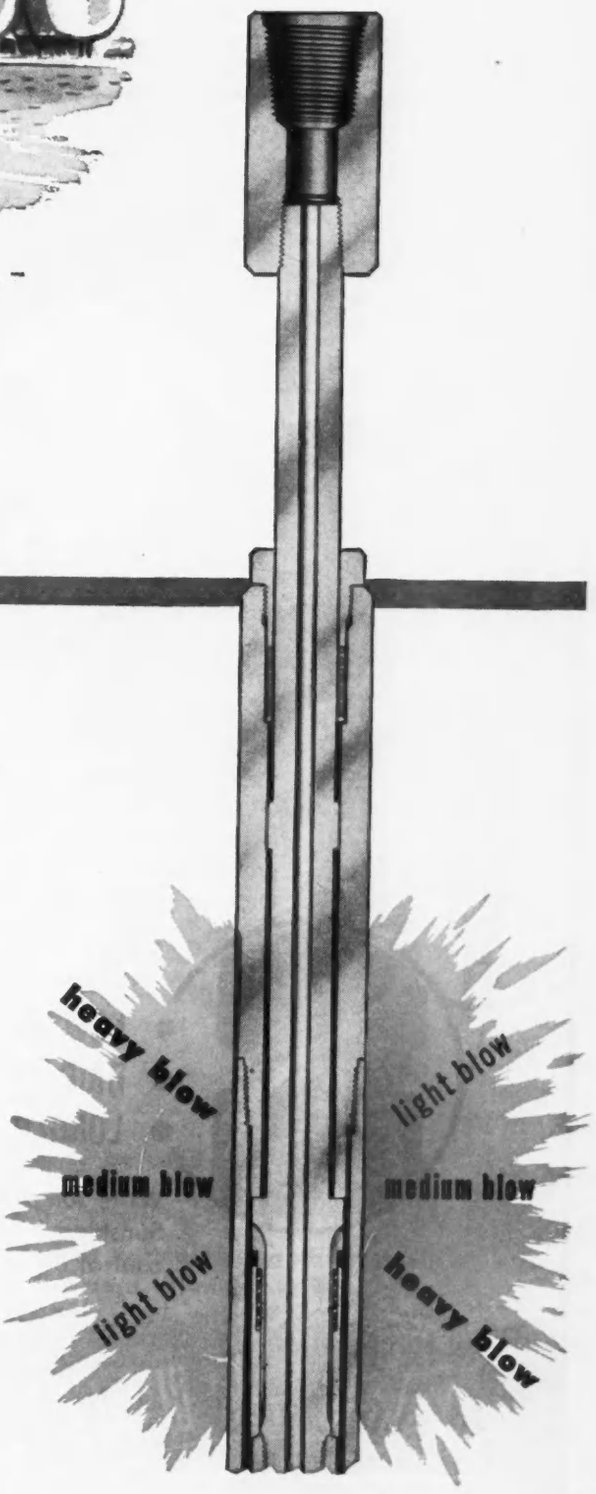
Ralph S. Cooley has joined the Joseph I. O'Neill, Jr., organization of Midland, Texas, as head of exploration. He was formerly with The Sharples Oil Corporation as manager of West Texas-New Mexico operations.

•

Alexander Deussen, consulting geologist, has moved his offices from 413 Commerce Building Addition to 1921 Commerce Building, Houston.

The right jar
for the job at hand

Jarring Jerry



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Transfers and Promotions:

John M. Clayton, formerly assistant chief geologist of the Mid-Continent division of Seaboard Oil Company of Delaware, Dallas, has been promoted to chief geologist. **Earl E. Westmoreland**, district geologist in Southern Oklahoma with headquarters in Ardmore, Okla., has been promoted to assistant chief geologist, Dallas. **W. H. Cardwell**, formerly Dallas supervisor of South Texas district, has been promoted to coordinator of land and geology, Dallas. **Mack E. McCann**, assistant district geologist in Corpus Christi, was promoted to district geologist there. **Meryl Williams**, the new district geologist in charge of Southern Oklahoma, was staff geologist in Dallas. Another former Dallas staff geologist, **Roy Benke**, was promoted to supervisory geologist in charge of the South Texas district. **Bruce Pearson**, junior geologist at Midland, Texas, has been named assistant district geologist at Corpus Christi. **S. J. Taylor**, supervisory geologist at Midland is now also supervisory geologist for the Abilene district, with headquarters in Dallas. **Norman Walker**, formerly geologist in the Midland district, was promoted to district geologist in charge of Central Louisiana, with headquarters at Alexandria, La.

L. H. Byrd, assistant district superintendent, London district, East Texas division, Humble Oil & Refining Company, transferred to the California district, Gulf Coast division, as assistant district superintendent. **J. T. Knauth**, assistant district superintendent, was transferred from the Friendswood district to the Lovell Lake district, Gulf Coast division. **H. V. Wait**, district petroleum engineer, moved from the Galveston Bay district, Gulf Coast division, to the Louisiana division office as supervising petroleum engineer. **William F. Shelton**, petroleum engineer, Grand Isle district, Gulf Coast division, transferred to the Economics & Statistics division, Houston, as senior petroleum engineer. **Jack M. Shepherd**, supervising petroleum engineer, was promoted to assistant district superintendent, London district.

C. C. (Buddy) Sellers has been transferred to Sterling, Colo., as geophysicist in Sohio Petroleum Company's subdistrict office covering the Julesburg Basin area. He was formerly assigned to interpretation work in the Houston district.

W. C. Chonette, Los Angeles Basin division manager for Shell Oil Company, has been named chief exploitation engineer for the Pacific Coast area with headquarters in Los Angeles. **B. P. Eastin**, formerly chief exploitation engineer in Los Angeles, succeeded Chonette as division manager in Long Beach.

K. M. Lawrence, formerly supervisor of geophysical crews for Amerada Petroleum Corporation, promoted to chief geophysicist, with headquarters in Tulsa . . . **H. A. Johnson**, district exploitation engineer for Shell Oil Company at Great Bend, Kansas, transferred to Oklahoma City as division exploitation engineer. **W. S. Crake**, former chief engineer for Shell at Houston, transferred to Kilgore, Texas, as division production manager. **O. L. Odale**, production engineer, moved form Kilgore to Houston. **H. M. Gandy** transferred to Oklahoma City from Baton Rouge, as engineer . . . **Ora C. Collins, Jr.**, engineer for Cities Service Oil Company, moved from Bartlesville, Okla., to Oklahoma City . . . **Charles B. Dugger**, Gulf Oil Corporation, transferred from Oklahoma City to Billings, Mont., as district landman for Montana. **Warren Smith** moved from Tulsa to the Salt Lake City district office as landman. **Steve Campbell** is also landman for the Wyoming office . . . **V. A. Peterson**, Sinclair Oil and Gas Company, named division geologist for the Central division, and transferred from Denver to Tulsa.

Forrest E. Wimbish promoted to district geologist in charge of Magnolia Petroleum Company's Kansas district, with headquarters in Wichita, Kansas. **Kenneth R. Joynt** transferred from assistant district superintendent of Magnolia's Lake Charles Producing district to the Vanderbilt district. **O. B. Jordan** transferred from assistant district superintendent of the Brownfield Producing district to the Lake Charles district. **John R. Hissom** transferred from assistant district superintendent of Healdton Producing district to Brownfield district. **William C. Dougherty** promoted from assistant foreman in Kermit Producing district to production foreman. **C. P. Latting**, production foreman in Salem, Ill., Producing district, transferred to Rusk Producing district, Kilgore, Texas.

John D. Foster, engineering department, Service Pipe Line Company, promoted to area engineer for the Illinois and Missouri divisions and transferred from Tulsa to

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By turning in every piece of worn-out equipment, every obsolete tool and machine, in fact every pound of iron and steel scrap you can comb out of your plant, you'll be helping relieve the worst scrap shortage since Pearl Harbor days . . . and the steel industry will be able to produce more of the steel you need.

Remember—it takes at least one-half ton of scrap to make one ton of steel. To maintain steel's present high production schedules requires more than 1400 carloads of industrial scrap *every* day. So turn in your scrap—ALL your scrap—and keep the mills rolling. This is more than a shortage. It's an emergency that vitally concerns you—and us—and the Nation.

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1-1348

UNITED STATES STEEL

Galesburg, Ill. . . . Humble Oil & Refining Company has promoted **C. H. Swan**, assistant district chief clerk, Hawkins district, to district chief clerk. He replaces **A. W. Compton**, transferred to new Palestine district as chief clerk. **Frank S. Tietz**, district chief clerk of Trawick Gas Construction district, transferred to Hawkins as assistant district chief clerk to replace Swan. **O. L. Furse**, assistant district superintendent at London, promoted to district superintendent at Pickton, replacing **L. O. Holloway**, who went to new Palestine district. **B. L. Jones**, assistant district superintendent of Talco District, East Texas division, transferred to the London district. He was replaced at Talco by **C. N. Hunt, Jr.**, formerly assistant district superintendent at the Pickton district. **Gayle B. Randolph, Jr.**, district civil engineer, transferred from Galveston Bay district, Gulf Coast division to Snyder district, West Texas division. **John S. Hacker**, senior civil engineer, Trawick Gas System, transferred to the Pickton district, East Texas division, as district civil engineer. **Wendall S. Westerfield**, civil engineer, Southwest Texas division, transferred to the West Texas division office as senior civil engineer. **Dandridge W. Marston**, civil engineer, East Texas division, transferred to the Goose Creek district, Gulf Coast division, as district civil engineer. **V. L. Garlington** transferred to the new Hamshire Construction district as district civil engineer. **A. E. McMillan**, district chief clerk, Houston Construction district, transferred to the Hamshire Construction district. **Fred L. Rexer** replaced A. E. McMillan as district chief clerk at the Houston Construction district. . . . Globe Oil and Refining, Lario Oil and Gas and Amcan Oil companies have made following changes: **C. M. Harris** promoted to chief geologist; **R. W. Edmond** named regional geologist at Oklahoma City; **E. O. Black** named manager of land and lease department; **Grover E. Ledlie** transferred from Calgary, Alberta, and **A. D. Turquette** transferred from Oklahoma City to be district landman and district geologist, respectively in the new offices at Denver.

•

H. W. Prentis, Jr., chairman of the board of directors of the Armstrong Cork Company, was elected today to the board of directors of The Atlantic Refining Company. The election of Prentis fills the vacancy on Atlantic's board caused by the recent death of A. A. Garrabrant.

Albert S. Munneke has been made superintendent of Service Pipe Line Company's Salt Creek district in Wyoming, with headquarters in Casper. He replaces **S. L. Cox**, resigned. **Ellston H. Brewer**, Shawnee, Okla., has been named area engineer for Oklahoma, replacing Munneke. **C. F. Gearhart, Jr.**, area engineer of the Wyoming division, has resigned and has been succeeded by **John H. Keyes, Jr.**, former oil traffic engineer. **Morrison Hynd**, an engineer in the Casper office since January, 1950, has been promoted to oil traffic engineer.

William C. Cooper, Casper engineer, has been transferred to the Missouri division with headquarters in Carrollton. He is replaced by **Lloyd W. Whitney**, who joined the company as a junior engineer at Scottsbluff, Neb., in 1947.

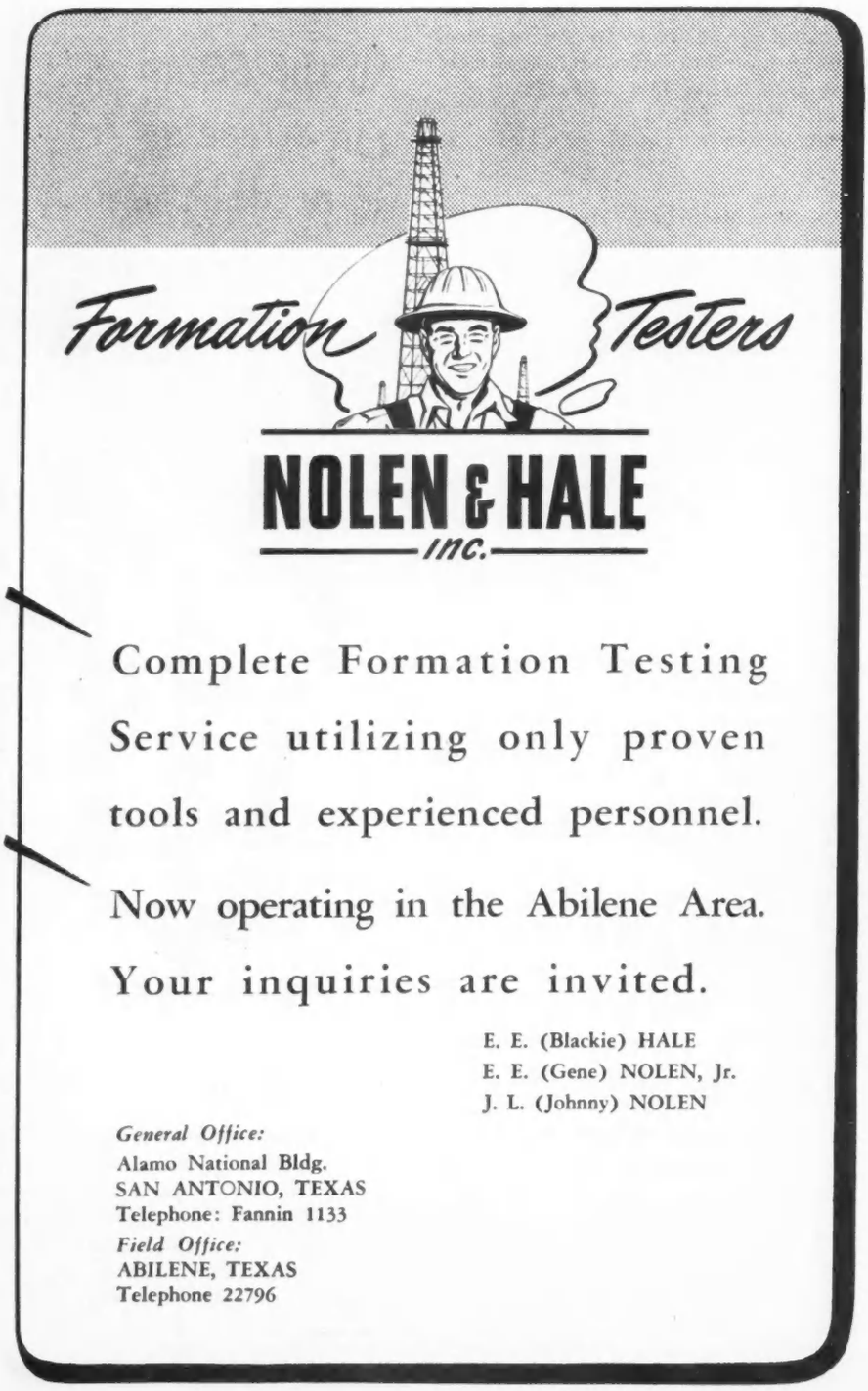
•

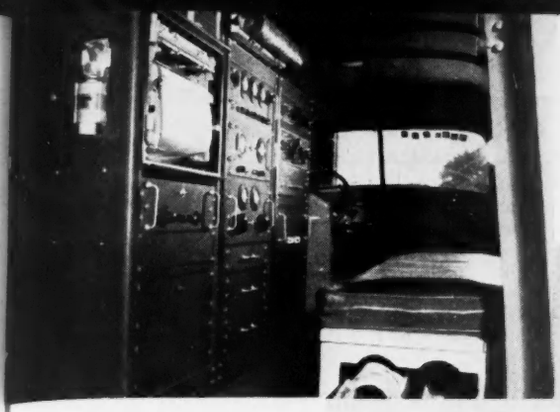
Ray S. Waterman has joined Kirkpatrick and McGuire, petroleum engineers, Shreveport, La., specializing in reservoir engineering work and in waterflood projects and appraisals of oil and gas properties. He served from 1943 to 1947 with the Arkansas Fuel Oil Company and then joined the Arkansas-Louisiana Gas Company in Shreveport, engaged in reservoir engineering work and as assistant chief production engineer.

Ray S. Waterman

•

Charles W. Sternberg has resigned as district geologist and manager for Sunray Oil Corporation in the Rocky Mountain office at Denver. He will continue to work in the Rocky Mountains in all phases of exploration, and will operate primarily in the Denver Basin area. Sternberg was formerly with The Atlantic Refining Company in both the Rocky Mountain area and in Mississippi, and with The Ohio Oil Company in Illinois.





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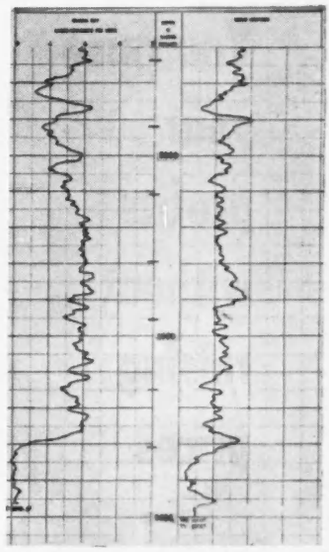

Example of PGAC simultaneous recording of gamma ray, Brons-neutron, and casing-collars. The gamma ray curve is on the left; the Brons-neutron log is on the right; with the casing-collars recorded in the center.

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R. G. Greene has been named manager of exploration for Union Oil Company's Western area, which includes the Pacific Coast, Rocky Mountain and Canadian divisions, and will be responsible for all land acquisitions in those regions. He has been manager of exploration in the Pacific Coast division since 1949, and is succeeded in that post by **John R. Sloat.**

Lon D. Cartwright will continue in charge of Union's exploration activities in the Gulf and West Texas divisions as well as unassigned and foreign areas. He will also serve as liaison with United Geophysical Company.

Greene was educated as a geologist at Cornell and Stanford. He joined Union Oil in 1929 for exploration work in Venezuela. From 1937 to 1943 he was in charge of natural resources investigations for the Union Pacific railroad and was active in the establishment of the Basic Magnesium Company in Las Vegas and the Kaiser steel plant at Fontana. In 1943 he rejoined Union Oil for exploratory work in Canada, the Rocky Mountains, the Pacific Northwest and along the Coast. In 1946 he was appointed manager of lands and made manager of exploration for the Pacific Coast division three years later.

Sloat was graduated from M.I.T. in 1934. For the next three years he served as a geophysical party chief in Texas, Kansas, Colorado and California. He joined Union Oil in 1938 and was appointed geophysical supervisor in 1940. In 1944 he was assigned to work on special area problems. When Union purchased United Geophysical Company in 1950, Sloat became coordinator of geophysical and geological data in the Pacific Coast division.

•

Dr. E. T. Heck, formerly chief of geology and engineering for Quaker State Oil Refining Corporation, has joined Minard Run Oil Company, Bradford, Penn., in a similar position. Dr. Heck received his Ph.D. from West Virginia University in 1942. He was with the West Virginia Geological Survey from 1935 until 1943, when he entered the U. S. Navy. After the war he was employed briefly on the staff of the New York Geological Survey, before joining Quaker.

E. T. Heck

•

Sterling S. Lacy, Jr., formerly with McAlester Fuel Company, Magnolia, Ark., has been recalled to active duty with the U. S. Army, and is serving with the 781st Engineer Petroleum Distribution Company, Fort Leonard Wood, Mo.

•

Ben S. Smith, Jr., has been named director of industrial relations for Lion Oil Company, succeeding **John W. B. Foringer,** resigned.

Smith attended Rice Institute. He joined Lion Oil in April, 1937, at the time the company acquired the assets of E. L. Smith Oil Company of Mexia, Texas. After work in several other departments, he transferred to the personnel department in 1942 and has been assistant personnel director since 1947.

Ben S. Smith, Jr.

•

Jacob J. Schmidt, general production superintendent of The East Ohio Gas Company, Cleveland, has been named assistant to the president. He will continue in charge of the company's production and storage operations. Schmidt joined East Ohio in June, 1924 as a geologist, and was appointed general production superintendent eight years later.

•

M. O. Johnson has been made assistant manager of the supply and transportation department of Phillips Petroleum Company. **J. L. Kyser** succeeds Johnson as coordinator, with **H. J. Horsch** assistant.

Johnson was also elected executive vice president of Phillips Pipe Line Company.

W. H. Wallace was named vice president in charge of the crude oil pipe line division.

You raise your profits without raising prices when you install JENSENS

With taxes soaring and costs going wild, you've got to cut corners and constantly ride herd on costs if you expect to make any profit at all.

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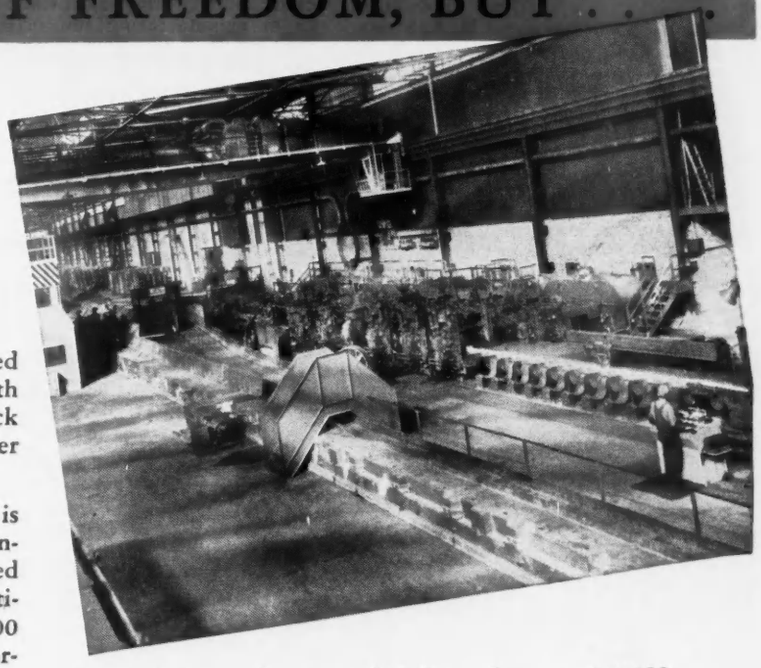

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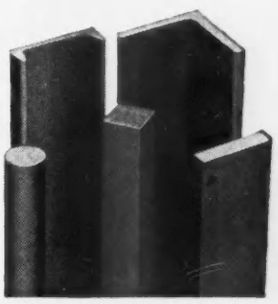

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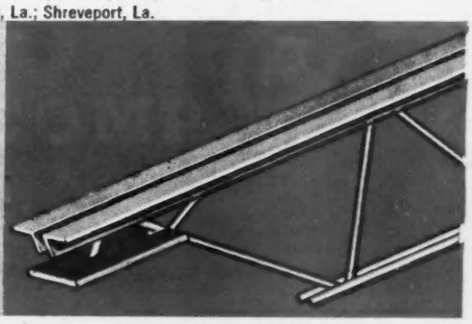

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MORE SCRAP MEANS MORE STEEL • TURN YOURS IN TODAY!

Thomas Brownfield, whose 24 years of varied oil industry experience dates back to the Seminole field of Oklahoma, has been named vice president in charge of operations for The Carter Oil Company.

The new vice president is in charge of all the company's producing, manufacturing and marketing operations. Exploration activities will continue under **H. F. Moses**, vice president.

A navy veteran of War I, Brownfield attended both the University of Tulsa and the University of Oklahoma. He began work for Carter as a clerk in the Oil Runs department in 1927. Later he transferred to the Scouting division and was promoted to chief scout in 1935. In 1941 he was named an executive assistant in the producing department of Standard Oil Company (N.J.) in New York. He returned to Carter in Tulsa in 1946, serving as secretary of the company.

Shortly after becoming manager of Carter's Economics department and coordinator of manufacturing and marketing, he was elected to the Carter Board of directors in 1948.

G. Dawson Priestman, assistant manager of the Economics department, will succeed Brownfield as department head.

The board of directors also elected **John M. Sprague** comptroller of the company succeeding **L. S. Collins**, who will remain as director in charge of Carter's accounting and allied departments.

•

Grove Lawrence

William Moeller, Jr.

Grove Lawrence has been elected vice president, Southern California Gas Company, to succeed **William Moeller, Jr.**, retired.

Lawrence has been with the gas company since 1925, and was most recently assistant vice president with headquarters in Los Angeles.

Moeller has completed more than 44 years in the gas business in Southern California and the Middle West. He had been a vice president of Southern California Gas since 1932.

•

O. E. Gram, area geologist, and **L. L. Crozier**, area landman, are in charge of Deep Rock Oil Corporation's Oklahoma City office, in line with a move consolidating all Oklahoma land and exploration operating activities.

Charles D. Moore, formerly with Stanolind Oil and Gas Company, also has been added to the Oklahoma City staff as geologist. **H. L. Curry** and **R. W. Bayliss** will continue to handle scouting activities from the new location.

In the division's headquarters at Tulsa, **Charles W. Lane**, who has been area geologist for southern and western Oklahoma and assistant to the geology manager, has been appointed technical and administrative assistant to the vice president. **I. S. Higginbotham**, longtime Deep Rock employe and recently Tulsa area geologist, has been named assistant to the geology manager. **Harry M. Cooper, Jr.**, a graduate of Ohio State University and Carnegie Tech, has joined the company as assistant geophysical manager.

Robert D. Gensch, former Tulsa area geologist, has moved to Wichita, Kansas, as area geologist to reopen the company's offices in the Petroleum Building. **Kenneth Holke** has joined the new office as assistant geologist.

In the Rocky Mountain area, the Sterling, Colo., office has been closed and a new one opened at Casper, Wyo. Former Sterling geologist **R. J. Field** and scout **R. G. Boekel** have moved to Denver, while **M. R. Reston**, scout and landman, has been transferred to Casper.

•

Chester L. Doyle has been advanced to assistant chief petroleum engineer in the Exploration department of General Petroleum Corporation. He is stationed at Vernon, Calif. Doyle joined General Petroleum in 1939 upon graduation from the University of California. His most recent position was senior petroleum engineer in the company's San Joaquin offices.

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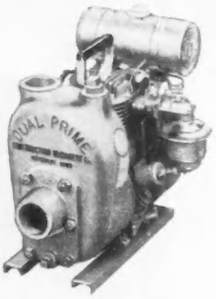

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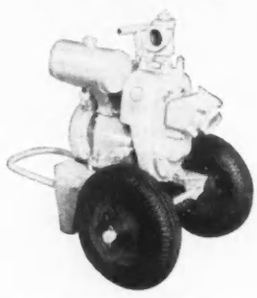

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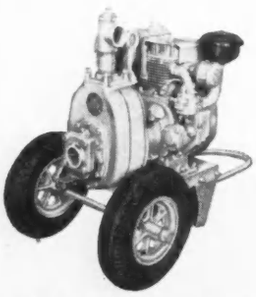

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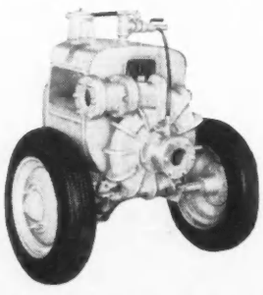

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J. L. Cramer and **W .A. Stubbs** have been named as district geologist and district landman for Stanolind Oil and Gas Company's newly established Northern Mountain district office at Billings, Mont.

Cramer has been with Stanolind since October, 1945, when he was hired as a geological scout at Wichita, Kansas. The following year he was advanced to geologist and transferred to Jackson, Miss. In 1948, Cramer moved to Casper and has been in the Rocky Mountain division since that time. After a year at Stanolind's division office in Casper, he was transferred to Billings, then a geological suboffice.

He majored in mining geology at the University of New Mexico.

Stubbs was graduated from the University of Oklahoma with both B.A. and L.L.B. degrees in June, 1941, and entered the Army the following month. After his discharge as a captain in 1945, Stubbs joined Stanolind in the Company's general office. A few months later, in March of 1946, he was sent to Jackson, where he was a landman before his transfer to Casper in 1948. After two years in the Rocky Mountain division, Stubbs served as landman at both Wichita Falls and Abilene, Texas, during 1950.

The new district office in Billings is in the Stapleton Building, and will serve all of Montana, North and South Dakota.

P. L. Hughen

E. J. Kennelly

Edward J. Kennelly, division manager at Downington, Penn., has been named division manager of Texas Eastern Transmission Corporation's new Division 5, which includes the area from Kosciusko, Miss., to the northern boundary of Kentucky along the route of the company's projected new 30-inch natural gas transmission line from Kosciusko to Connellsville, Penn. Division 5 offices are at Lebanon, Tenn.

W. C. Britt

William Fallcaf, formerly assistant manager of Division 4 at Baytown, Texas, is assistant division manager at Lebanon.

Paul L. Hughen, formerly division manager at Baytown, replaces Kennelly as manager of Division 3 at Downington.

William C. Britt, former assistant division manager at North Little Rock, Ark., has transferred to Baytown as division manager. **Earl Humble** has been advanced from division engineer to assistant division manager at Baytown.

At North Little Rock, **Robert S. Cooper,** previously division engineer, is now assistant division manager.

•

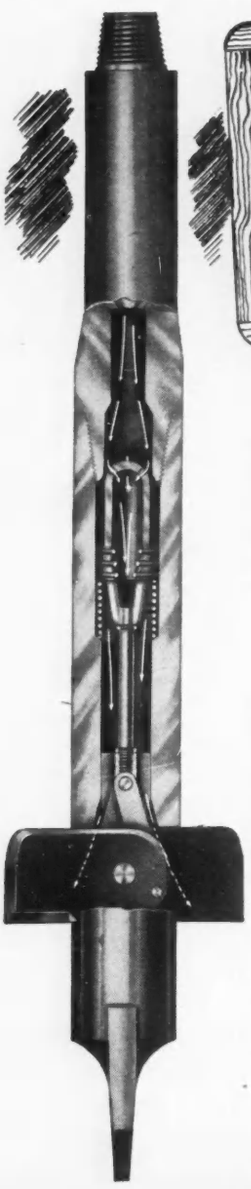
S. L. Carter, division geologist, and **Melvin E. Thrash,** division land superintendent, are in charge of Continental Oil Company's new division exploration office at Roswell, N.M.

Carter was transferred from Billings, Mont., where he has been in charge of Continental's geological work since 1949. He is a graduate of the University of Wisconsin and holds a Ph.D. in geology. He joined Continental in 1945 at Denver.

Thrash joined Continental at Wichita Falls, Texas, in 1944 as a scout and lease man. In 1947 he was transferred to the company's general offices at Ponca City, Okla., in the land section, and in 1950 became assistant to the land section manager at Houston.

Bird G. Swan, of Ponca City, chief geophysicist for Continental Oil Company, has been promoted to assistant manager of the company's geophysical section. Swan will continue to make his headquarters in Ponca City.

He joined Continental as a member of a geophysical crew in 1932, following graduation from the University of Oklahoma. He became control geophysicist in 1937 and was made geophysical superintendent in 1948.



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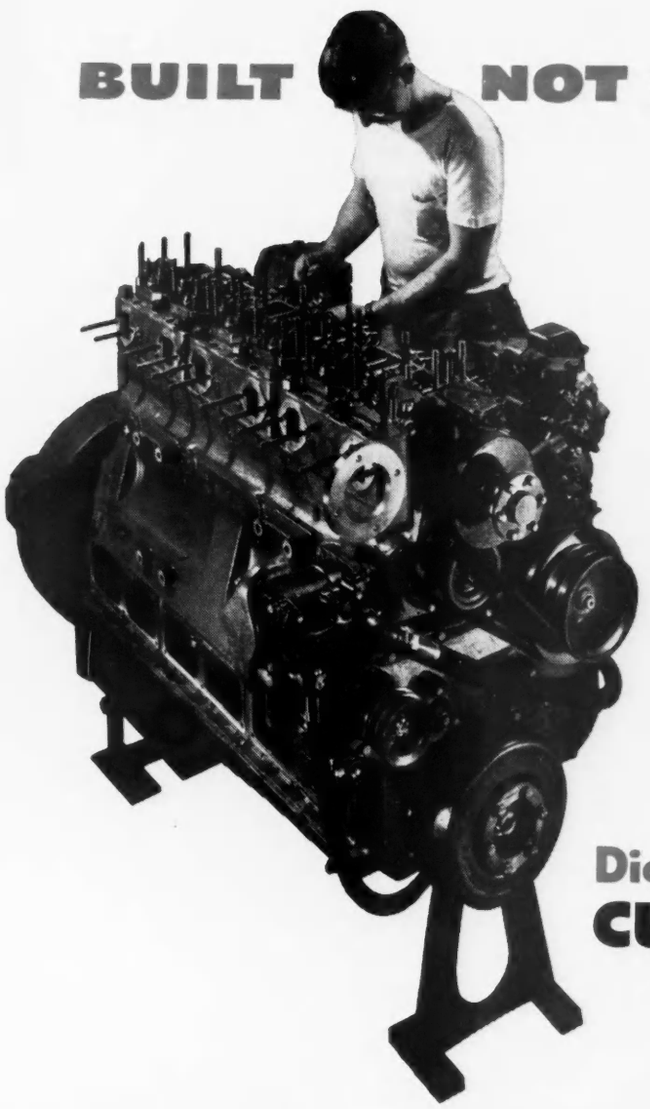

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DEATHS

Earle S. Porter, 62, of Tulsa, vice president in charge of production for Amerada Petroleum Corporation, died August 14 in St. Louis. He had been with Amerada since 1921, rising from research chemist to vice president. Earlier he was an assistant chemistry professor at the University of Oklahoma and a chemist for Du Pont at Arlington, N. J.

•

Wilbur Judson, 71, senior vice president and a director of Texas Gulf Sulphur Company, died August 9 in New York City. He was a resident of Newgulf, Texas. Judson was also a vice president and director of Sulphur Export Corporation and a director of Mesabi Iron Corporation.

Jesse Lee Woodruff, 51, Dallas oil operator, died August 15 in Ennis, Texas, as a result of injuries suffered in an automobile accident.

•

B. G. von Roeder, 71, Houston independent oil operator, died July 5 in El Campo, Texas. A Houston resident for 50 years, von Roeder had worked for Sinclair Oil and Refining Company before setting up his own office as an oil operator.

Walace E. Hawkins, 56, vice president and general counsel for Magnolia Petroleum Company and Magnolia Pipe Line Company, was shot to death August 5 at his Dallas home. His 16-year-old son confessed the slaying. An oil industry attorney for many years, and the author of a treatise on the mineral laws of Texas, Hawkins was a member of the executive committee of the Mid-Continent Oil and Gas Association, and a leader of the American Bar Association. He had been with Magnolia's Legal department since 1925 and vice president and general counsel since July, 1939. Hawkins entered politics when he was 21 and was elected to the Texas Legislature from Runnels County in 1916. When the U. S. entered World War I, he resigned his seat to join the Army, from which he was discharged as a captain at the war's end. He returned to the University of Texas and was graduated from the Law School in 1920. In 1921 he was named assistant attorney general of Texas, and served until 1924, when he resigned to go into private practice in Houston. The next year he entered the Legal department of Magnolia.

Walace E. Hawkins

•

Sol H. Kauffman, 71, retired member of the legal staff of the Tulsa office of The Texas Company, died August 14. He retired in 1946 after 25 years with Texaco.

•

Max H. Engel, 59, managing director of Deutsche Vacuum Oel AG., died in Germany May 15. He joined Deutsche Vacuum Oel AG. in 1919, and was appointed member of the board in 1930. In June, 1933, Engel was made chairman of the board. Under his management the Deutsche Vacuum, formerly purely an importing company, became interested in crude production and processing.

•

Frank E. Renner, 70, maintenance supervisor for Cities Service Oil Company in the Bartlesville, Okla., area until his retirement last year, died July 6 in Bartlesville.

•

Roy B. Thompson, 66, of Tulsa, independent oil man, rancher and real estate operator, died July 6 at Las Vegas, N.M.

•

Harvey Howard Lee, 57, driller of the George Strake discovery well which opened the Conroe, Texas, field in the early 30s, died July 30. He was field superintendent for the Strake interests when he retired in 1946.

•

Thomas P. Gregory, 90, one of the early developers of the petroleum and gas industries in the U. S., died July 11 in Pittsburgh. He had served as chairman of Lone Star Gas Company and as director of Quaker State Oil Refining Corporation, and was an executive in several gas and utility companies.

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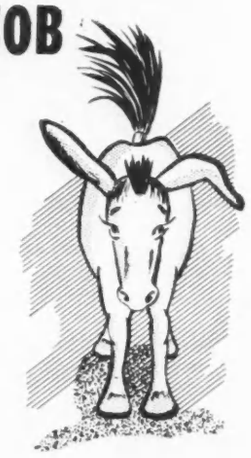

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Mechanical Engineering Meeting Set for Tulsa September 24-26

The sixth annual conference of the Petroleum Division, American Society of Mechanical Engineers, will be held at the Mayo Hotel, Tulsa, September 24-26.

About 40 technical papers will be presented during the three-day meeting. Among the titles scheduled are "Some Kenematic Aspects of Pumping Unit Mechanisms," "Latest Development in Percussion Drilling," "Conversion of Existing Diesel Engines to Dual Fuel," Mathematical Analysis of Sucker Rod Pumping Problem," "Development of Metal Arc Electrodes for Special Welding Applications," "Application of Pipe Line Control Equipment to Field Operations," and "Pipe Line Alarm and Control Circuits, Physical and Electronic."

Compact Commission to Meet In Fort Worth September 10-11

Governor Allan Shivers of Texas, chairman of the Interstate Oil Compact Commission, announced that the 1951 Summer Meeting of the Commission will be held in Fort Worth September 10-11.

All standing committees will meet in all-day sessions Monday, September 10. Tuesday, September 11, will be devoted to reports of committees and a business session.

Headquarters will be at the Texas Hotel.

Oscar Chapman Will Address Texas Mid-Continent Group

Secretary of the Interior Oscar L. Chapman will participate in second-day activities of the Texas Mid-Continent Oil & Gas Association's 32nd Annual Meeting, which will be held in Beaumont October 8-9, Charles E. Simons, Dallas, Vice President and General Manager, announced.

Oscar L. Chapman

Secretary Chapman will be the principal speaker October 9 at the dedication of the new Lucas Engineering Building at Lamar State College of Technology, named after the discoverer of the famous Spindletop well. The dedication ceremonies will highlight the final-day program of the Texas Mid-Continent meeting and will climax the 50th anniversary observance of the Spindletop discovery.

Under the nation's defense program, Secretary Chapman is the Petroleum Administrator for Defense. He was named as Interior Secretary in January 1950, following the resignation of former Secretary Julius A. Krug.

Association committees will meet Sunday, October 7, prior to the general sessions, which get under way Monday at 10 a.m. with the first business meeting. W. Alton Jones, API chairman and president of Cities Service Company, will speak following the President's Address by R. B. Anderson. Distinguished Service Awards will also be presented at Monday morning's session.

Speakers at the second business session, which begins at 2 p.m. Monday, will be Ladd Haystead, agricultural relations counsellor, and L. S. Westcoat, president of The Pure Oil Company.

Also on the program Tuesday morning is an address by Hon. Allan Shivers, governor of Texas, who will introduce Chapman.

Ross Heads Arrangements For SEG Pittsburgh Meeting

An eastern regional meeting of the Society of Exploration Geophysicists will be held in Pittsburgh October 25. Ralph B. Ross, of Gulf Research and Development Company, is general chairman of program and arrangements for the meeting.

Ralph B. Ross

Ross, who is chairman of the eastern regional program committee for SEG, will be assisted by Frank Press, Columbia University, and Bruno Winkler, Standard Vacuum Oil Company, New York City. L. F. Melchior, D. A. Davis and W. B. Robinson, all of Gulf Research, are in charge of local arrangements.

Registration and headquarters for the convention will be at the Webster Hall Hotel in Pittsburgh, and a full day of technical sessions will be conducted in the Mellon Institute Auditorium.

TIPRO Directors Will Convene In Tyler for Mid-Year Session

Tyler, Texas, has been selected the site for the mid-year directors meeting of the Texas Indpendent Producers and Royalty Owners Association, to be held Friday, September 28. Executive Committee and special committees will meet the day before.

The meeting will get under way with a business session at 10 a.m., followed by a luncheon and afternoon open forum with guest speakers. The Directors Dinner, to be held in the American Legion Hall, will be attended also by several hundred oil operators from the area.

North Texas Geologists Elect

Lyman C. Dennis, The Pure Oil Company, has been elected president of the North Texas Geological Society. Other officers are Philip Larson, Cities Service Oil Company, vice president, and Willis H. Alderman, Stanolind Oil and Gas Company, secretary-treasurer. All are from Wichita Falls.

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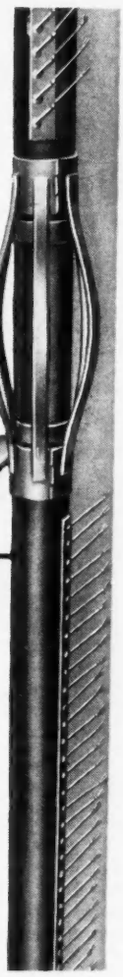

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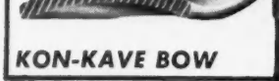

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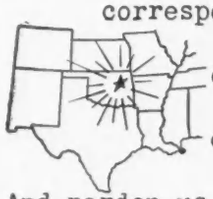

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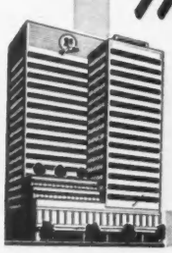

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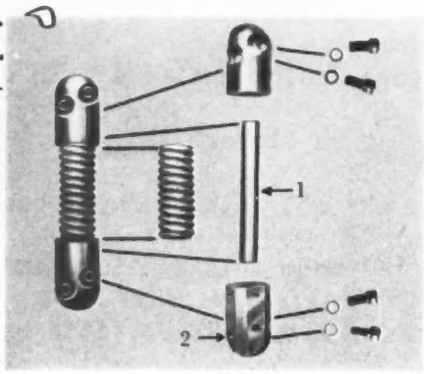
Demand has been greater than supply, but "Lit'l Oscar" Reamers are coming off the line in greater numbers now. Write for prices and delivery information.



EXPLODED VIEW OF CUTTER ASSEMBLY—(1) Free-moving pin prevents concentration of wear and stress at a single point. This reduces danger of pin failure. (2) "Vee" ways and straight shoulders absorb impact. Cap screws serve only to hold cutter assemblies in pocket. They take no stress.

"Lit'l Oscar" Reamer bodies require no welding in manufacture. All wearing parts are replaced when cutters are changed.

Petroleum Tool Co.

P. O. BOX 281 • ODESSA, TEXAS

ASSOCIATIONS

McHose Is Appointed to API Information Department Post

Harry William McHose has joined the staff of the Department of Information of the American Petroleum Institute in New York as editorial director. He succeeds Joseph H. Mader, resigned. McHose will be in direct charge of preparation of Oil Industry Information Committee booklets, leaflets, pamphlets and other materials.

McHose was educated at College of Idaho and Columbia University School of Journalism. Before joining API, he operated his own public relations firm in New York.

Houston Cost Accountants Name Hughes President for 1951-52

R. Hersel Hughes, controller for John W. Mecom Company, has been elected president of the Houston Chapter of the National Association of Cost Accountants.

R. Hersel Hughes

New vice presidents are Anan Golub, secretary and controller of Mission Manufacturing Company, and Willis B. Davis, assistant division accountant of South Texas division Producing department, The Texas Company. R. Bruce Myers, chief accountant for Mecom Company, was elected secretary, and Louis R. Mills, assistant treasurer of Crown Central Petroleum Corporation, was named treasurer.

Texas Petroleum Study Group Offers Research Assistantships

Applications are being received by the Texas Petroleum Research Committee for research assistantships in secondary recovery at the University of Texas and Texas A. & M. College. Stipend will be $1800 per year, and opportunity will be afforded for half-time graduate study leading toward the M.S. and Ph.D. degrees in petroleum engineering.

George H. Fancher, director of the committee, is receiving the applications at the University of Texas, Austin 12, Texas.

Technical Program Set for NACE Annual Conference in Galveston

Eight technical symposia, a general corrosion session and two round table discussion sessions are scheduled for the technical program of the 1952 annual conference of the National Association of Corrosion Engineers. The meeting will be held at Galveston, Texas, March 10-14.

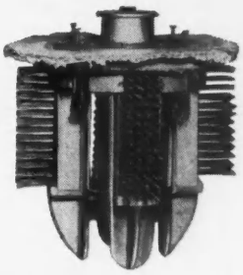
Technical committee meetings will be held Monday, March 10, preceding the formal opening of the conference, and also during the remainder of the conference week.

Exhibits and meetings will be held on the Galveston Pleasure Pier, while the Buccaneer Hotel will be convention headquarters.

THE CAVINS DUMP BOTTOM...

is the tool you need for dumping any amount of cement, sand, gravel, acid, or chemical, etc., in a continuous operation without interruption. The full open throat eliminates the hazard of stringing a load through the fluid column. There are no valves, sleeves, or ports to become fouled or clogged—no danger of accidental or premature unloading due to line whip or faulty brakes.

THE CAVINS BRIDGING PLUG ... for use in combination with the CEMENT DUMP BOTTOM, is ideal for use in starting an off-bottom bridge or plug. Made of drillable material, the Cavins Bridging Plug can be used for temporary or permanent installations.



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For MUD and WATER Lines

- **Quick, smooth, positive opening and closing**
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- **Seat is easily removable when necessary**
- **Adjustable top gland for placing handle in position**

Many drilling contractors and companies all over the world, wherever they are drilling for oil, are repeat customers for this release valve. Due to its efficient operation, this release valve gives positive seal and release under all pressure and field conditions. There is positively no "kick" when this valve is opened or closed. AVAILABLE FOR IMMEDIATE DELIVERY. Made in 2" size only for 5000 p.s.i. working pressure.

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Rotary's OIL FLUOROSCOPE

is the portable tool giving bit-end information at the surface

- Whenever OIL IS PRESENT in sandstone, limestone, or dolomite, you see oil in formation samples . . . for Rotary's fluoroscope differentiates between mineral and oil fluorescence.
- Built expressly for oil industry, properly wave-lengthed at 3650 angstroms (best for oil detection) and can be used with microscope in one operation.

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- Kansas Blue Print Company—Wichita, Kansas
- Kintzel Blue Print Company—Casper, Wyoming
- Eberbach & Son Company—Ann Arbor, Michigan
- Rotary Engineers Limited—Edmonton, Alberta, Canada
- Triangle Blue Print & Supply Co.—Oklahoma City and Tulsa, Okla.
- Greene Brothers, Inc.—Dallas, Texas
- W. H. Curtin & Company, Domestic and Export, Houston, Texas, and New Orleans, Louisiana

Rotary ENGINEERING & MANUFACTURING CO.

MIDLAND, TEXAS

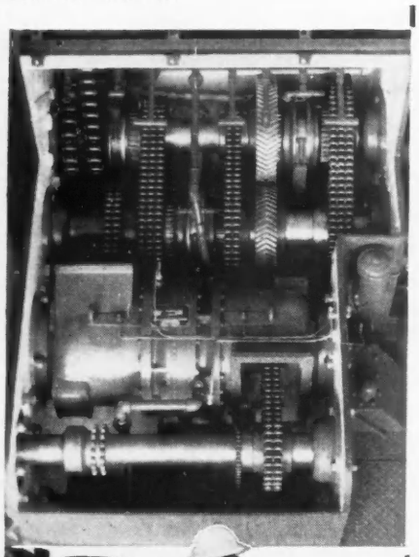
More than 2 Years without Trouble

When you think of a Twin Disc Hydraulic Torque Converter, generally you think of how it *saves the rest of the rig,* cushions out shocks, picks up the load smoothly without jerks.

But, in itself, the Twin Disc Torque Converter posts some money-saving service records.

Take the unit which went out on the first T-25 Rig ever built by the National Supply Company, for example. For more than two years—drilling 74 wells, making a total of 220,000 feet of hole—the Twin Disc Torque Converter delivered power without that first sign of trouble, then it was given a field over-haul.

It is trouble-free performance like this, for less maintenance on the rest of the rig, less maintenance on the torque converter itself that makes operators prefer Twin Disc. Twin Disc Hydraulic Torque Converters, available in capacities up to 1,000 hp, cushion out shocks, dampen engine vibrations, and multiply engine torque instantaneously and automatically to match rig speed to rock formation hardness.



This National Supply T-25 Rig, the first ever built and owned by Skiles Oil Corporation, Grayville, Ill., is equipped with a Twin Disc Hydraulic Torque Converter.

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

ASSOCIATIONS

California Oil Producers Name Standing Subcommittee Members

Emil Kluth, representative from Santa Fe Springs, Calif., was elected chairman of the Administrative Committee of California Oil Producers. Kluth is vice president of Pacific Western Oil Corporation. Other members of the Administrative Committee are R. A. Holman, E. A. Gray, Sol Alexander and T. W. Bell.

An Engineering Board was elected to study oil field performance and conservation. M. D. Hughes, representative from Wilmington field harbor area, and chief petroleum engineer for the City of Long Beach, was elected chairman. Other members are M. G. Arthur, T. H. Acres, D. E. Koch, O. W. Chonette, H. F. Power, H. F. Dangberg, William L. Hobro, R. N. Ayars, and S. A. Patterson.

The new standing subcommittees will serve one year.

Gulf Engineer is ASME Nominee

Reginald J. S. Pigott, director of the Engineering division of Gulf Research & Development Company, Pittsburgh, has been nominated as 1952 president of the American Society of Mechanical Engineers. Election will take place in the fall by letter ballot of the membership.

AAPG To Meet in Los Angeles

Los Angeles will be host city for the 1952 annual convention of the American Association of Petroleum Geologists. AAPG annual meetings were held in Los Angeles in 1937 and 1947.

Author Offers Clarification Of Buckling Experiments

Sir:

In March, 1950, I gave a paper entitled "A Study of Buckling of Rotary Drilling Strings" at the Oklahoma City meeting of the API Mid-Continent District, Division of Production. You have published this paper in a few issues of WORLD OIL starting March, 1951. Since the paper was given, some of the findings have been checked by field experience, namely, the values of critical weights on bit for which various sizes of drill collars buckle and start drilling a crooked hole. Tests are being run concerning straight hole drilling by use of stabilizers located at the points of maximum deflection.

On the other hand, some laboratory experiments have been recently made, and it has been found that the buckled curve 4, seen in Figures 9 and 10, corresponds to an unstable form of equilibrium and actually does not exist. The purpose of this letter is to warn your readers that some statements and recommendations concerning the second order of buckling are erroneous and that the corrected text will be published soon in the 1950 volume of "Drilling and Production Practice (API)."

ARTHUR LUBINSKI,
Research Engineer, Stanolind Oil and Gas Company, Tulsa.

(EDITOR'S NOTE: Under the title, "Buckling of Rotary Drilling Strings," Lubinski's paper was published as a four-part article in the March, April, May and June isues of WORLD OIL.)

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BJ
PYRAMID TOOTH
tong die

SAFER TO USE!
WILL NOT CHIP

BJ's exclusive Selective Hardening process provides shock-absorbing core and ends plus super-hard teeth.

For all rotary and casing tongs

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AN AMAZING NEW WATER TREATING SOLUTION FOR WATER COOLED ENGINES.

Here is the answer to the request by the oil industry for a simple, effective, fool-proof water treatment. Just pour in the quantity recommended and Chromine will:

- PREVENT SCALE FORMATION IN ANY WATER COOLED SYSTEM
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ALSO MAKERS OF:
COMMERCIAL AND DOMESTIC WATER SOFTENERS
AMBERLITES OR GEL ZEOLITES
REMOVAL FILTERS FOR: CHLORINE, IRON, OIL
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Stephenville, Texas

Dear Mr. Heaton:

Since mobility is the keynote for our drilling equipment, we need to maintain our automotive units at a high level of efficiency at all times.

For this reason we are glad to be a satisfied user of CHAMPION Q-X UNDERSURFACE LUBRICANT. After we found your product satisfactory for our mobile equipment, we have used it in our stationary units on our drilling operations.

The Illinois Basin presents a number of problems to oil well drilling—a wide variance in temperature from summer highs to winter frigid lows. Our machinery has to be kept in tip-top condition to keep going day and night.

Since we are native Texans in this company, we are glad to recommend CHAMPION Q-X UNDERSURFACE LUBRICANT to our friends in the oil industry from Texas to the Illinois Basin. Although we have been in this section since 1938, coming here from the Permian Basin, we are still interested in products developed in Texas and have found CHAMPION Q-X UNDERSURFACE LUBRICANT a real champion in the tests to which we have subjected it.

Sincerely yours,
J. H. Gilliam
GILLIAM DRILLING COMPANY

For Free Demonstration or technical information: Contact

CHAMPION PRODUCTS, Inc.
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Perrin & Sacre Corp., 2816 E. 11th St., Los Angeles, Calif.
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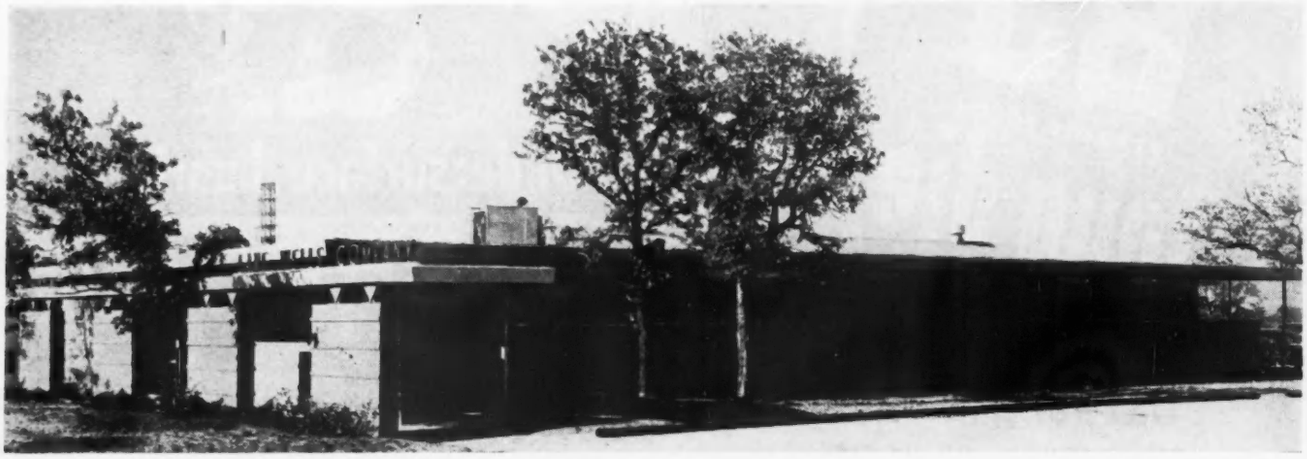
Longhorn Sales, Inc., Box 1471, Oklahoma City, Okla.
All American Trading Co., Managua, Nicaragua, C. A.

EQUIPMENT AND SERVICE SUPPLIERS' NOTES



The Mid-Continent Division of Lane-Wells Company has moved its offices to this new location in Oklahoma City. The new offices at 5800 North Eastern are on the same property with the shop.

Wage Agreement Ends 100-Day Strike By Lufkin Foundry & Machine Workers

The 100-day-old strike by five American Federation of Labor craft unions ended August 12 as an agreement was reached between the Lufkin Foundry and Machine Company and union representatives.

The union accepted the wage proposal that was offered by the company before the strike began May 7. Pickets were removed from Foundry entrances immediately following the signing of the new contract.

Foundry officials said the strikers will be put back on the jobs as quickly as practical operations of the plant will permit.

Plant operations have been continued by the Lufkin Foundry and Machine Company during the period of the strike.

"The Greatest Name in Cable Tools..."

Acme

TRUSTWORTHY SINCE 1900

PETROLEUM EQUIPMENT SUPPLIERS MEMBER ASSOCIATION

. . . to-be-Sure — Always Ask for Acme's Alloy Bits...

A most reasonable extra FIRST cost buys you ½-century's biggest bit buy. Delivers 50% or more actual in-hole action than any "regular" bit. Acme "Drilmor" ALLOY meets the increasing demand for a new type bit fully capable of cutting HARDEST formations; assuring more in-hole time.

Another feature (saving wasted out-time) is that Acme's Alloy Bit can be dressed and tempered in the field. And without special equipment; like "regular" bits. EXTREME, deeper penetrating hardness makes Acme's non-competitive Bits hold cutting edge, wear longer, resist battering, even in toughest going. They're longer life bits for your longer profit.

Write NOW for Alloy Bit's full facts and your copy Acme's latest Cable Tool Catalog — containing proper field treatment of bits.

Fig. 108AA. Acme Alloy Bit. 51-years' specialized "know-how" makes it worth more to YOU.

ACME DRILLING & FISHING TOOLS

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Western Inspection Company Appoints Lubke Manager of Louisiana Division

J. F. Lubke

Western Inspection Company, Midland, Texas, has appointed John Frank Lubke as manager of the Louisiana division with headquarters at Lafayette, La. Lubke has been with the company more than two years and has had wide experience in the pipe inspection field.

Western maintains other offices in Houston and Oklahoma City.

Harrisburg Sales & Service Opens Branch Field Store in West Texas

Opening of a branch store at 200 West First Street, Odessa, Texas, was announced by Harrisburg Sales & Service, Inc.

Charles B. Caldwell, president of the Houston firm, said that this is the first field store opened and operated by Harrisburg, but that another is now under construction in Oklahoma City, and will be in operation within a month.

Fawick-Airflex clutches, a Harrisburg low pressure alarm, and a Harrisburg Muderator have been added to the company's line of products, which includes Harrisburg Diamond Hard pump liners, Harrisburg Long Run pistons and MOECO catheads.

The new Odessa office and warehouse building is of steel frame construction, 90 x 40 feet.

William D. Barnett is in charge of operations at Odessa, and Leroy Nix and Monte Kyle Roy are storemen. C. Roger Eason is in charge at Oklahoma City.

Wm. Cameron & Co.

Oldest Established Dealer in Drilling Mud and Chemicals in the Permian Basin and in the East Texas Field

DISTRIBUTORS OF BAROID PRODUCTS
RIG TIMBERS MUD AND CHEMICALS
COMPLETE ENGINEERING SERVICE
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H. S. Duke, Ass't Division Mgr.
J. T. Sikes, Ass't Division Mgr.

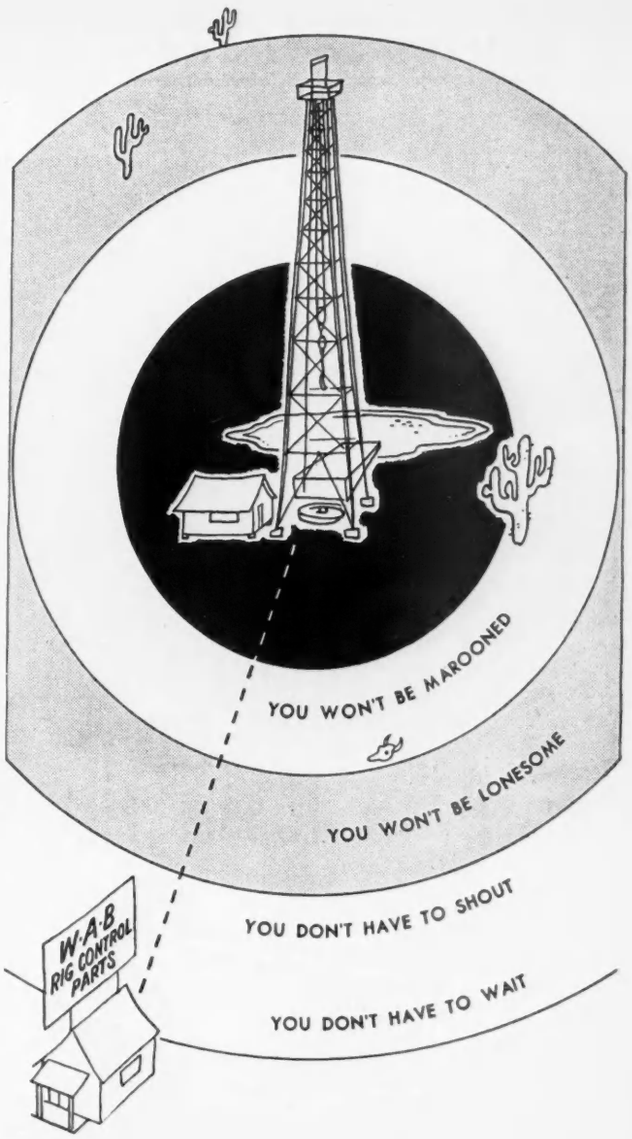
DISTRICT OFFICE—Overton, Texas—Ph. 2331
W. D. Watson, District Manager

WEST TEXAS STORES	MANAGER	PHONE
Big Lake	Z. I. Ashcraft	27
Big Spring	W. S. Crook	745
Brownfield	Aubrey Cates	208
Colorado City	Clarence Peck	1014
Crane	Otho Blount	2211
Denver City	Harold Mead	123
Eldorado	W. M. Patterson	2-3691
Fort Stockton	W. J. Waller	3
Iraan	B. C. Watson	29
Kermit	Grady Willoughby	2531
McCamey	L. J. Gilbert	11
Midland	Jack Porter	4-7407
Monahans	I. E. Porter	114
Odessa	A. C. Akins	6-6843
Post	B. R. Hamm	520
Rankin	Max Lewis	123
San Angelo	H. O. Timmons	4143
Seminole	L. E. Tipton	154
Snyder	Zack Gibson	1386
Sonora	H. M. Smith	2-2681
Sundown	E. E. Smith	2831
Wink	Grady Willoughby	3571
Winters	M. E. Leeman	4481
Abernathy Warehouse	Call Sundown	2831
Barnhart Warehouse	Call Big Lake	27
Bronte Warehouse	Call San Angelo	4143
Jayton Warehouse	Call Post	520

NEW MEXICO STORES	MANAGER	PHONE
Eunice	R. R. Haney	2421
Hobbs	Claude Pierce	18
Jal	Bill Greenlee	2421
Tatum Warehouse	Call Hobbs	18

EAST TEXAS STORES	MANAGER	PHONE
Carthage	Weldon Moore	369
Gladewater	W. A. Scharborough	123
Greggton	Chas. Gilland	1228
Hawkins	Harold Sieber	41
Kountze	C. E. Leatherwood	164
Overton	W. A. Elliott	5941
Winnsboro	J. D. Wolseley	119
Tyler Warehouse	Call Overton	5941

MUD ENGINEERS	TOWN	PHONE
Bill Beard	Seminole	154
Allen Bruton	Odessa	6-6843
Stanley Cathey	Snyder	1386
Hershall N. Cox	Odessa	6-6843
Ken Davis	Brownfield	208
W. E. Holman	Seminole	154
Sam Jones	Midland	4-7407
Leon Koonce	Odessa	6-6843
Bill LeSourd	Hobbs, N. M.	18
Monroe Martin	Snyder	1386
Joe Plemons	Odessa	6-6843
J. D. Williams	Tyler	2-5222



We Aim to Stick Close to YOUR job

When you own a rig with W.A.B. Controls, you not only get tops in performance and dependability—but assurance of speedy maintenance service, too. Our Parts Stocks are spotted at convenient points . . . so you're never far from a source of supply, organized to serve you fast and well. Make a note of the address in your locality, so you can reach us at once in case of need.

WESTINGHOUSE
AIR BRAKE COMPANY
WILMERDING, PENNA.
INDUSTRIAL PRODUCTS DIVISION

Factory Branch: Emeryville, Calif. Distributors throughout the United States. Consult your Classified Directory. Distributed in Canada by: Canadian Westinghouse Co., Ltd., Hamilton, Ontario

A New Brownsville Branch has been opened recently by Stewart & Stevenson Services. Stewart & Stevenson, the nation's largest distributor of GM Diesel Engines, has other branches located in Houston, Corpus Christi, Dallas, Lubbock, McAllen and Wichita Falls, Texas.

O-C-T "PC" CHOKES WERE DESIGNED SPECIFICALLY TO GET THE JOB DONE AT EXTREME PRESSURES

This O-C-T Choke was actually designed for trouble-free, long-life 15,000 and 20,000 lb. service. It provides speed because bean replacement is accomplished simply by removing a hand tight cap. Besides, it provides flexibility, strength and durability. Ask your O-C-T Representative or write for details on this dependable high pressure choke. Available through your supply store.

Oil Center Tool Co.
P. O. Box 3091, Houston, Texas

Dougherty Is Elected Oil and Gas Vice President by Empire Trust

Jack Francis Dougherty has been elected a vice president in the oil and natural gas department of Empire Trust Company, New York City. Previously Dougherty was vice president of DeGolyer & MacNaughton, serving as senior geologist and petroleum and natural gas engineer. From 1942 to 1945 he was associated with Phillips Petroleum Company at Amarillo, Texas. Dougherty received his bachelor and master of science degrees in geological sciences from California Institute of Technology. He holds memberships in the AAPG and AIME, and a fellowship at the California Institute in Geological Research.

J. F. Dougherty

CRC Engineering Organization Offers Complete Pipe Line Design Services

Formation of CRC Engineering Company, Houston, a new organization to provide engineering design services for crude, gas and products pipe lines, including economic studies of proposed projects, was announced.

Partners are H. E. (Herb) Fisher, A. S. Crutcher, Gene Rolfs and Jim Cummings.

Fisher, who recently resigned as chief engineer of Standard Oil Company (Indiana), has been associated with the engineering design and construction of pipe lines for 20 years. Crutcher, Rolfs and Cummings have operated for more than 18 years in the development, manufacture and supply of equipment for the pipe line industry.

H. E. Fisher

Keystone Driller Company Acquires Dresser Equipment Spudder Business

Keystone Driller Company, Beaver Falls, Penn., manufacturer of power shovels and cable drills, has purchased the complete cable tool drilling machinery business of Dresser Equipment Company, Columbus, Ohio, according to Harold J. Ruttenberg, Keystone president.

All finished machines, repair parts and related equipment are being moved to Keystone's Beaver Falls plant.

... another reason why drillers prefer

Standco
NO-SMOKE
BRAKE LINING

Standco Brake Blocks are made of cabled cords of long fibre asbestos — woven solid and reinforced with bronze wire to prevent pulling loose on the bolts. They will not burn or smoke or score brake rims.

More deep wells have been drilled with Standco than with all other blocks combined. It's your answer for low-cost hole-making.

STANDCO BRAKE LINING COMPANY
Factory and General Offices
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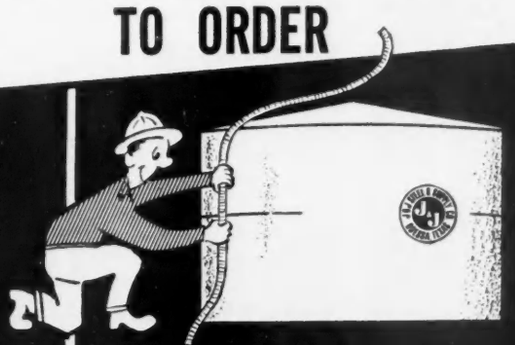
STEEL FABRICATION TO ORDER



FOR THE OIL INDUSTRY

- OIL STORAGE TANKS
- SKIDDED WATER TANKS
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- MUD TANKS
- TOOL HOUSES
- UTILITY HOUSES
- SUB-STRUCTURES
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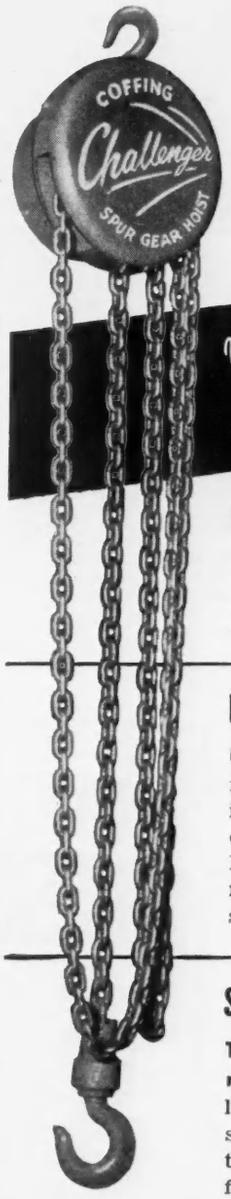
Distributors
Armco Steel Buildings

J&J STEEL & SUPPLY CO. — ODESSA, TEXAS
STEEL FABRICATORS

NEW

Coffing Challenger



What you have been waiting for in a Spur-Gear Hoist

Light Weight

Carry it with one hand. One-ton model, with coil chain for standard lift of 8 ft., weighs only 38 lb.

Ruggedly Dependable

Use it year after year. Long life is built in . . . sealed in. Housing is formed steel plate — will not crack under sudden shock loads. Back plate is laminated for extra rigidity. Hoist mechanism has sealed-in lubricant.

Safe

Trust it to protect men and equipment. Tested at 100 percent overload. All load-holding parts are special alloy steel. This hoist actually has a five-to-one safety factor.

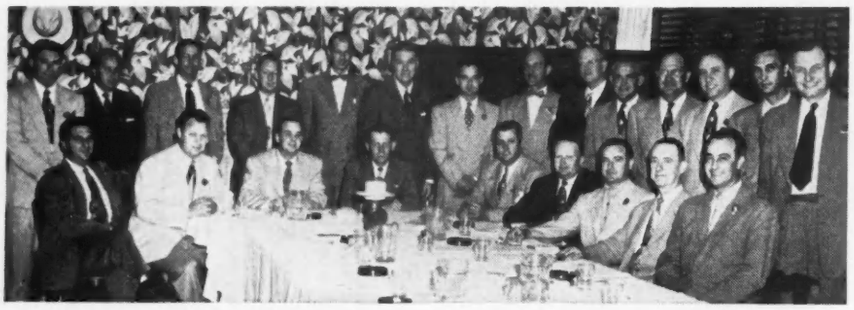
Economical

Service it yourself. The Challenger may be completely disassembled in minutes with simple tools. No lost travel time to and from the factory for repairs.

Find out more about the all-new Coffing Challenger, available in ½- and 1-ton capacities. Write for Bulletin 09C.

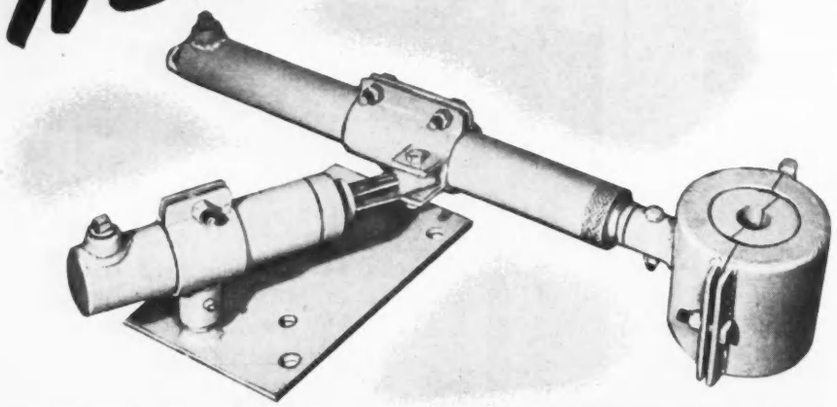
COFFING HOIST COMPANY
Danville, Illinois

QUIK-LIFT ELECTRIC HOISTS • HOISTALLS • RATCHET LEVER HOISTS • MIGHTY-MIDGET PULLERS • DIFFERENTIAL CHAIN HOISTS • LOAD BINDERS • I-BEAM TROLLEYS



W. C. Norris, Manufacturer, Inc., management, engineering, production and sales executives are pictured at the company's fifth annual general sales conference in Tulsa. Seated, left to right, are Jack C. Schaff, Wichita Falls, Texas; Arthur Miller, Jr., assistant sales manager; G. W. Davidson, sales manager; M. L. Parker, Odessa, Texas; LeRoy Mitchell, Casper, Wyo.; Jack Getty, Shreveport; A. L. Ethriedge, Oklahoma City; R. A. Colgin, vice president in charge of plant operations; S. A. McGill, Odessa. Standing, left to right: C. B. Schofield, Tulsa city sales; J. E. Giles, northern Oklahoma and eastern Kansas; D. W. Stewart, Midland, Texas; D. P. Hagaman, Salem, Ill.; J. H. Coman, manager material control, Tulsa plant; Edw. C. Bolger, president; W. J. Whitaker, Fort Worth; A. A. Hardy, chief engineer, Tulsa plant; J. W. Bowen, Houston; W. C. Tolleson, Kilgore, Texas; C. T. Fair, Great Bend, Kansas; W. L. Butler, executive vice president; C. L. Snelling, Tulsa city sales; K. M. Cook, Abilene, Texas.

NEW!



REDUCE WIRE LINE WEAR with NEW COLLINS HYDRAULIC GUIDES

- Dampen line vibration
- Prevent uneven spooling
- Reduce crown block wear

Collins Hydraulic Wire Line Guide hydraulically absorbs whip and lash of line at high speeds, reducing line vibration and resultant wear.

Your line spools evenly at highest speeds, preventing kinking, drum crushing and dog legs due to uneven spooling and pile-up on the drum.

Crown block wear is reduced, protecting against line pinching from worn sheave grooves.

Oil company engineers estimate that wire line life is increased from 10 to 20% with Collins Guides.

ADD NEW LIFE TO YOUR WIRE LINE

Complete assembly furnished, ready for easy installation on standard or jackknife rigs. No drilling or welding required.
Hydraulic action adjustable to all drilling requirements. Long lasting, low-cost, easily replaceable plastic insert in guide head will not wear line nor strip lubricant from line.

AVAILABLE THROUGH SUPPLY STORES ONLY

COLLINS ENGINEERING *Corporation*

P. O. Box 8251 Phone LYnchburg 2106 Houston 4, Texas

Superior Iron Works and Supply Appoints Three to Sales Positions

Superior Iron Works and Supply Company, Shreveport, announced three additions to its Sales department.

W. A. (Pinkie) Meagher joined Superior as sales representative in Shreveport. He has been in the supply business 11 years. Also at Shreveport is John L. Morgan, who has had 17 years experience in the field, including ten with the Ideco division of Dresser Equipment Company.

W. A. Meagher

J. D. McCammon has been named to the Dallas Sales department. A graduate of Texas Technological College, McCammon has been in the supply industry six years.

J. D. McCammon

J. L. Morgan

Harley Moves General Offices

The Harley Sales Company, exclusive oil field distributor of Wisconsin air-cooled, heavy duty engines, has moved its general offices to more spacious quarters in the Tri-State Building, 619 South Main, Tulsa.

Pipe Perforating Plant Opened

Kobe, Inc., has opened a new pipe perforating plant in Long Beach, Calif., to provide modern mill slotting service to that area. John Augsburger is in charge of the plant at 3241 Cherry Avenue.

EQUIPMENT and SERVICE SUPPLIERS' NOTES

Corbin Joins Byron Jackson Company As Oil Tool Division Representative

Boyce F. Corbin

Boyce F. (Bud) Corbin has been appointed sales and service representative for the Oil Tool division, Byron Jackson Company, covering the Illinois, Indiana and Michigan territory. His headquarters are at Olney, Ill. For the past several years, Corbin has been with Loffland Brothers, Fred Manning and Brinkerhoff drilling companies in the Rocky Mountain area.

H. K. Porter Company Appoints Hinderliter Tool General Manager

L. L. Garber

L. L. Garber, vice president of H. K. Porter Company, Inc., has been appointed general manager of the company's Hinderliter Tool Company division, Tulsa. He has been succeeded as general manager of Porter's American-Fort Pitt Spring Division by H. A. Harrington, former works manager. Garber has been in production management and industrial relations positions since his graduation from Carnegie Institute of Technology in 1932 with a B.S. degree in works management.

Dowell Announces Assignments in West Texas and Oklahoma Districts

Ray S. Ousterhout, former development engineer with Dowell Incorporated at Odessa, Texas, has been transferred to the Midland, Texas, district office and promoted to district sales engineer. Ousterhout, a graduate of the University of Tulsa, started with Dowell in 1943.

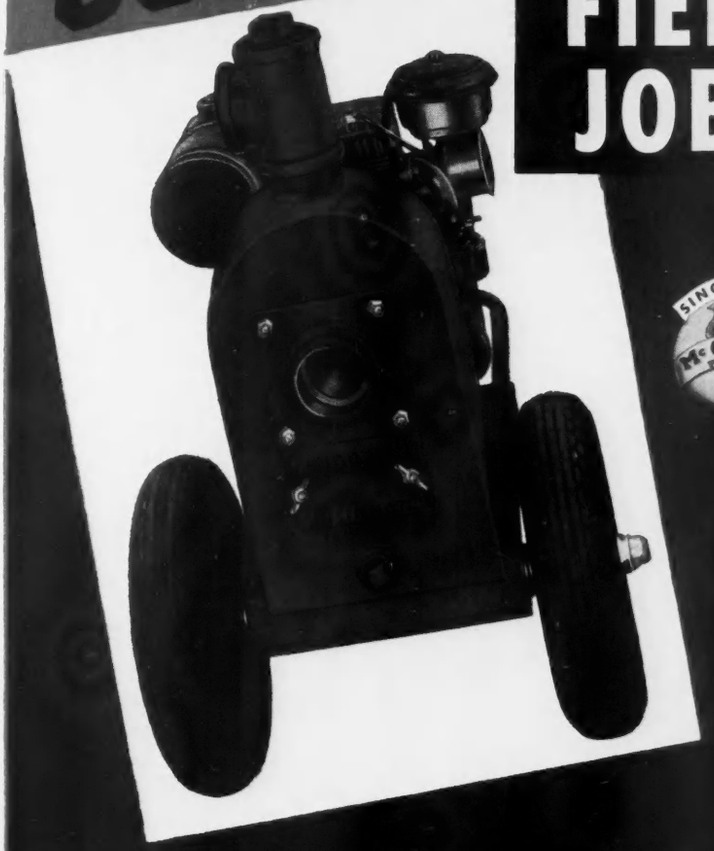
Clay Courter, formerly sales engineer at Hobbs, N.M., replaces Ousterhout at Odessa. Courter is a graduate mechanical engineer from the University of Oklahoma, and has been with Dowell since 1947.

Warren Sallee, previously stationed at Snyder, Texas, as service engineer, has moved to Hobbs to replace Courter. Sallee joined the firm in 1949.

Ellsworth W. Hudgens has joined Dowell's Tulsa staff as a development engineer specializing in cathodic protection for retarding electrolytic corrosion of pipe lines, industrial equipment, and other buried and submerged metals. Hudgens was formerly with Gulf Oil Corporation. He obtained his bachelor and master's degrees in chemical engineering from Missouri School of Mines.

Dowell also announced that it had established an operating station in Beaumont, Texas, at Fourth and Terrill streets. Station manager is J. C. Ivy, formerly a service engineer at Alice, Texas.

BEST for OIL FIELD JOBS



McGOWAN

SELF-PRIMING CENTRIFUGAL OIL PUMPS

McGOWAN PUMPS are in operation in Oil Fields all over the world — backed by the reputation and integrity of a Company that has been building Pumps since 1852. McGOWAN PUMPS are unequalled for ruggedness, durability and the ability to do the job — BETTER — MORE ECONOMICALLY.

They feature AUTOMATIC PRIMING — SYNTHETIC RUBBER GASKETS AND SEALS — LARGE ACCESS PLATES. Can be furnished with electric or belt drive.

McGOWAN PUMPS are available at your Supply Co. Complete information can be furnished by writing or calling McGowan Pump Co., Central Ave., Cincinnati, Ohio.

McGOWAN
LEYMAN MANUFACTURING CORP.
PUMPS
58 CENTRAL AVE., CINCINNATI 2, OHIO

McGOWAN PUMP DIV., Leyman Mfg. Corp.
58 Central Ave., Cincinnati 2, Ohio
Please send without obligation data on McGowan self priming centrifugal pumps.

COMPANY_____
NAME_____
ADDRESS_____

Gulf Coast Division management, sales, engineering and operating representatives of Lane-Wells Company met in Houston for a two-day conference to discuss sales and operations. Among the 51 present were Rodney S. Durkee, president; James D. Hughes, general sales manager; and Morton T. Higgs, manager of field operations. Sessions were under the direction of John J. Neale, Gulf Coast division manager, and R. M. Rutledge, Jr., Gulf Coast division sales manager.

RED DEVIL

"DIA-HARD" LINERS

For high pressure abrasive service

Forged in one piece from highest quality alloy steel. The deep HIGH-CARBON wear resistant case of maximum hardness and uniformity is obtainable only by our SPECIAL "DIA-HARD" PROCESS, greatly excelling all other known methods for longer life liners. The bore is PRECISION HONED, and ACCURATE OUTSIDE DIMENSIONS insure a perfect working fit with liner packing assembly and pump cylinder for positive leakproof sealing. Write for Catalog No. P-120.

TELL-TALE LINER PACKING ASSEMBLIES

Gives warning before damage

Tell-Tale Liner Packing Assembly consists of two "DIA-TEX" oil and heat resistant sealing rings separated by a precision made steel, corrosion-resistant lantern ring. Internal leakage is detected instantly in slush pumps through "tell-tale holes" before costly fluid cuts occur to cylinder walls. There is either a Tell-Tale Liner Packing Assembly or a "DIA-TEX" Sealing Ring available for all makes of slush pumps. Write for Catalog No. P-121.

LINER PULLERS

Save valuable time and labor

The Red Devil Liner Puller is a strong, heavy duty, dependable tool capable of pulling the most obstinate liner. Its operation is simple. There are no pins, connecting links or other small parts to bend, shear, break or become lost.

The "Universal Type" Puller (as illustrated) is designed for slush pumps. The "Expanding Grip Type" is designed for pulling thin wall-driven tube type liners, as used in small pumps. Write for Catalog No. P-122.

See Composite Catalog . . . For more detailed information on Red Devil Products, see the Composite Catalog or write for special price catalogs noted above. Red Devil products are available through your supply store.

OIL WELL MANUFACTURING CORP.
6008 S. Alameda Street, Los Angeles 1, California

Cameron Iron Works Promotes Three In Texas and Rocky Mountain Areas

Three new division managers named by Cameron Iron Works, Houston, are G. L. Teer, Houston division; F. H. Isaacks, Southwest Texas division; and M. L. Hooks, Rocky Mountain division. All have been members of the Cameron sales staff for many years.

Teer was formerly district sales manager in Corpus Christi. Isaacks, formerly sales representative in New Iberia, La., now makes his headquarters in Corpus Christi. Stationed in Casper, Wyo., where he was previously sales representative, Hooks is in charge of the new warehouse there.

G. L. Teer

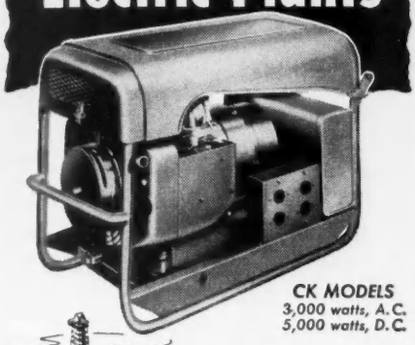
F. H. Isaacks

M. L. Hooks

Web Wilson Names Sales Agent

F. L. (Lee) Rathert has been appointed sales agent for Web Wilson Oil Tools, Inc., at Farmington, N.M. His address is Box 96, telephone 285-J; or in care of Farmington Supply Company, phone 735-W.

ONAN *Oilfield* Electric Plants



CK MODELS
3,000 watts, A.C.
5,000 watts, D.C.

HEAVY-DUTY PORTABLE & STATIONARY MODELS
Diesel, Gas, Gasoline-powered

● ONAN oilfield electric plants provide dependable light and power for oil field applications. A complete range of A.C. and D.C. models... all conservatively rated for continuous, dependable service helps you choose the right plant for the job. Lightweight, air-cooled models from 400 to 5,000 watts; heavy-duty, water-cooled, gas-gasoline-driven plants from 5,000 to 35,000 watts. Air-cooled Diesel electric plants 2,500 watts. Water-cooled Diesels from 12,500 to 55,000 watts, powered by IH engines.

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5966 University Ave., Minneapolis 14, Minn.

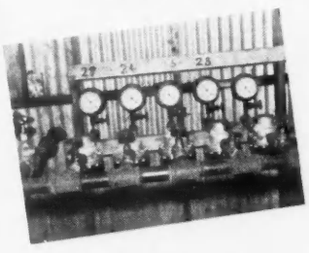
SECONDARY MODERN RECOVERY

TECHNICAL CONSULTING
PRODUCTION ENGINEERING
SERVICE, INCLUDING
CORE ANALYSIS

PRESSURE MAINTENANCE WITH GAS OR WATER

REPRESSURING WITH GAS OR WATER

Water Flooding Installation Showing Input Well Water Meter and Pressure Manifold



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PETROLEUM ENGINEERS
CABLE & STINE
WICHITA FALLS, TEXAS

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Your Santa Fe Freight Representative knows the answers to your problems

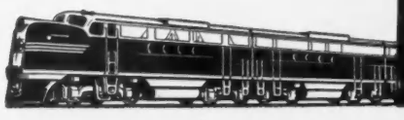
Your Santa Fe freight representative is a professional "answer man," with ready access to the collective information, knowledge and "know-how" of Santa Fe's entire organization of transportation specialists.

He is either in your town, or has your town assigned to him. Either way, he is no further away than your telephone.

Call on him freely for expert advice on your shipping problems. Find out why *it pays to ship Santa Fe all the way.*

F. H. Rockwell, *General Freight Traffic Mgr.*
Santa Fe System Lines, Chicago 4, Illinois

Santa Fe—*all the way*



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POROSITY

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GRAVIMETRIC METHODS

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Contracts accepted for domestic and foreign projects, using the most improved instrumental and interpretative technique.

William M. Barret, Inc.

Consulting Geophysicists

GIDDENS-LANE BUILDING
SHREVEPORT, LOUISIANA

Standco
NO-SMOKE

STANDCO BRAKE LINING

Stands the gaff and gets the job done without scoring brake rims. See pages 3973-3978, Composite Catalog.

Standco Brake Lining Co.
HOUSTON

HOUSTON LABORATORIES

Analytical and Consulting Chemists

Hydrocarbon Gas Analyses, Reservoir Equilibria Studies for Crude and Condensate well, Waters, Brines, Corrosion and Industrial Analyses.

Phone CApitol 1319, Box 132, Houston, Texas

EQUIPMENT and SERVICE SUPPLIERS' NOTES

McCormick Steel Company has opened this new 14,400 square foot steel warehouse at Lubbock, Texas. McCormick is the first large steel company to offer a complete stock of both carbon and alloy steel to West Texas. With a working staff of 21 persons, McCormick will cover and be able to make quick deliveries in West Texas, New Mexico, southern Colorado, and southern Oklahoma. Stock items include hot rolled sheets, hot rolled plates and floor plates, bar size and structural shapes, hot rolled slots and strips, hot and cold finished rounds, alloy rounds, cold finished squares, deformed reinforcing bars, galvanized corrugated roofing, galvanized flat sheets, and expanded metal.

New Owners Will Operate Carr Firm As Donnally Geophysical Company

Earle W. Johnson and Chester A. Donnally have jointly purchased Carr Geophysical Company and will operate the crews under the name of Donnally Geophysical Company. Headquarters for the organization will be in Dallas.

Johnson was elected president of the new company and Donnally was elected vice president. Johnson is also president of General Geophysical Company and Donnally was formerly with Western Geophysical Company. No other changes are planned in the organization, it was stated.

Carr Geophysical was organized in 1944 by George Carr, who died in December, 1950, and was operating three crews when it was purchased.

Attention, West Texas Oil Operators!

You will find all the essentials for the drilling and producing of oil at ***Our Store in Snyder***

This store is located four miles west of Snyder on Highway 180 (to Lamesa). It is very convenient to the "Diamond M" and "Sharon Ridge" Canyon pools in Scurry and the "Von Roeder" and "Reinecke" pools in Borden County.

We welcome the opportunity to be of service to all operating in this area, old friends and new. Our telephone number at Snyder is 1353.

The PRODUCERS Supply & Tool Co.

Main Office: FORT WORTH, TEXAS

Other Stores in Texas

GRAHAM WICHITA FALLS CORPUS CHRISTI
OLNEY KAMAY HOUSTON

EQUIPMENT and SERVICE SUPPLIERS' NOTES

Corry Advanced to Sales Manager Of Franks Manufacturing in Tulsa

Stuart E. Corry has been appointed sales manager of Franks Manufacturing Corporation, Tulsa, replacing A. H. Knight, resigned.

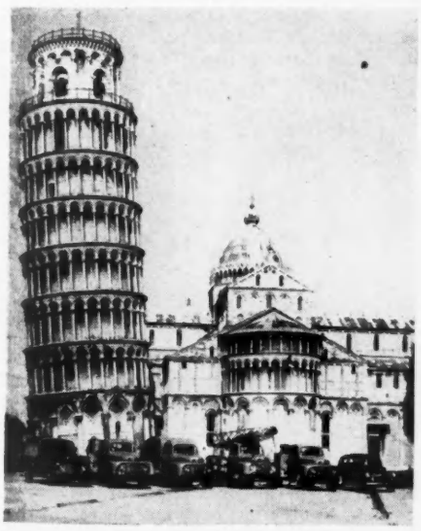
Stuart E. Corry

Corry has served Franks in both engineering and sales capacities since 1943, including positions of assistant chief engineer, chief products engineer, Illinois district sales manager, Texas Gulf Coast district manager, and most recently as Oklahoma district manager of sales and service.

Geophysical Service Appoints Dyk Rocky Mountain Division Manager

Robert Dyk has joined Geophysical Service Inc., as manager of the Rocky Mountain division with headquarters in Denver. He is a graduate of the University of California and has been engaged in geophysical exploration for the past 15 years. Before joining GSI he was senior geophysicist for General Petroleum Corporation at Bakersfield, Calif.

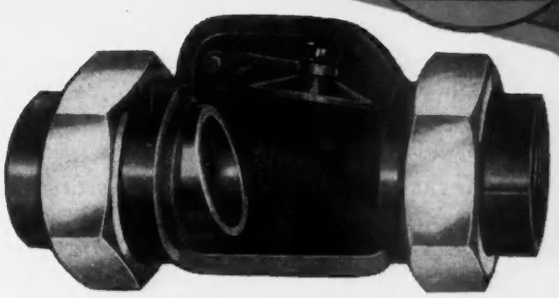
Robert Dyk



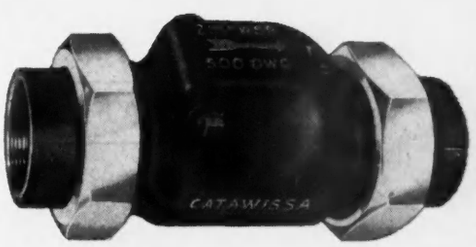
Complete Rolling Equipment of a Western Geophysical International field party is shown lined up before the Leaning Tower of Pisa in Italy. Left to right are a pickup truck, water truck, recording truck, drilling truck, shooting truck, and a passenger sedan. Western has six such crews operating in Italy. European activities of the company are under the direction of M. A. Boccalery, vice president, who is aided by Thomas P. Maroney.

FLOW LINE AND PIPE LINE TYPE

FULL OPENING FOR 100% UNOBSTRUCTED FLOW!



Here is a FULL OPENING Double Union Swing Check Valve designed and recommended for the rough and ready demands of oil country applications. A compact, efficient, economical, easily accessible unit for use in lines where no stop is installed close to the check valve and where pipe cleaning mechanisms are used. Equipped with Catawissa PERFECT SEAL Unions on both ends!



SIZES: 2" to 4"; Refax Metal bodies, Hitensiloy working parts; 500-lbs. service OWG; 1500-lbs. test; 250 psi WSP

write for CATALOG 11 showing the complete Catawissa line

CATAWISSA PERFECT SEAL UNIONS AND VALVES ARE STOCKED & DISTRIBUTED BY

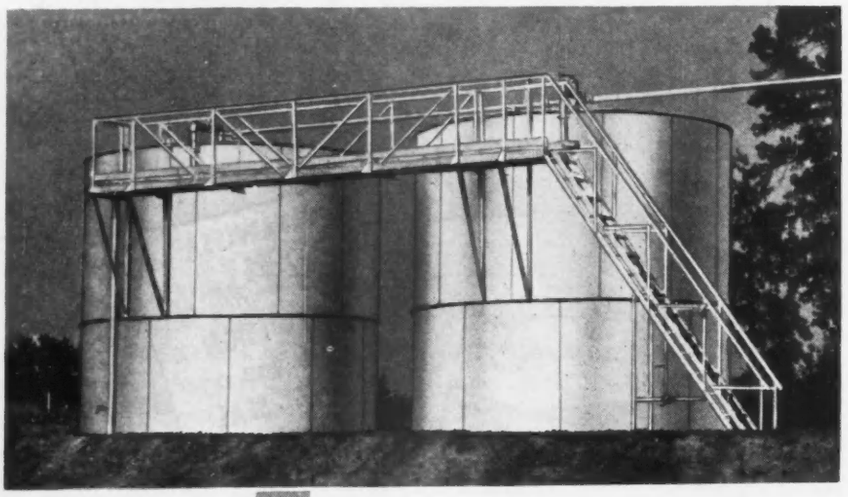
OIL WELL SUPPLY CO.

Branches Serving All Oil Fields

CATAWISSA VALVE & FITTINGS COMPANY

60 MILL STREET ★ CATAWISSA, PENNA.

Better Fit...Better Protection Assure Longer Tank Life



BUTLER

Bolted Steel OIL TANKS

Butler tanks fit more tightly. Each tank section is formed on precision dies. These precision-made sheets are then accurately punched so that they fit exactly. Thus you get an oil-tight fit throughout the long life of the tank.

Butler tanks have better surface protection. Electrostatic painting puts a uniform coating on all tank parts. Each hole, each edge, each sheet gets a tight, 2-coat paint bond that resists corrosion and rust. They're also available with hot-dipped galvanized coatings and aluminum decks.

Extra care . . . extra skill assure longer life for Butler Bolted Steel Oil Tanks and make them your best long-term investment.

DEPENDABLE SERVICE

from these Butler Distributors

AMERICAN PIPE & SUPPLY COMPANY

Casper, Wyoming — Denver, Colorado — Cut Bank, Montana

HARRY G. MILLER

El Dorado, Arkansas

UNION TANK & SUPPLY COMPANY

Fort Worth, Texas	Tyler, Texas	New Orleans, La.
Houston, Texas	Midland, Texas	Great Bend, Kansas
Odessa, Texas	Nocona, Texas	Tulsa, Okla.
Snyder, Texas	Lafayette, La.	Oklahoma City, Okla.
Alice, Texas	Ruston, La.	Hobbs, New Mexico

These Butler specialists can also give you service or information on
Walkways • Stairways • Unit Heaters • Other Oil Field Equipment

BUTLER MANUFACTURING COMPANY

Kansas City, Mo. — Galesburg, Ill. — Richmond, Calif. — Birmingham, Ala. — Minneapolis, Minn.

EQUIPMENT AND SERVICE SUPPLIERS' NOTES

Assignments in Canadian and U. S. Districts Anounced by Lane-Wells

Lee J. Lobdell has been appointed vice president and manager of Lane-Wells Canadian Company to replace C. F. Ludwig, who has been made assistant division manager of the Pacific Coast division of Lane-Wells Company. Lobdell, who has been with the company 14 years, has been superintendent of various districts of the Gulf Coast division. Ludwig joined the company in 1937.

L. J. Lobdell

Ray A. Hancock, previously assistant Pacific Coast division manager, has been transferred to Oklahoma as assistant Mid-Continent division manager. A graduate of the University of California, Hancock has been with the company 13 years.

C. F. Ludwig

R. A. Hancock

Dean Hoffman has been named Los Angeles district superintendent to replace James F. Alexander who has been recalled to military duty. Hoffman startd with Lane-Wells in 1944 and was most recently Ventura truck station superintendent. He is succeeded at that post by Carl H. Leidecker, former Electrolog operator.

Lane-Wells also announced the opening of a new sales office in the Patterson Building in Denver, under the direction of Ed Saye III, district sales engineer.

Ed Saye III

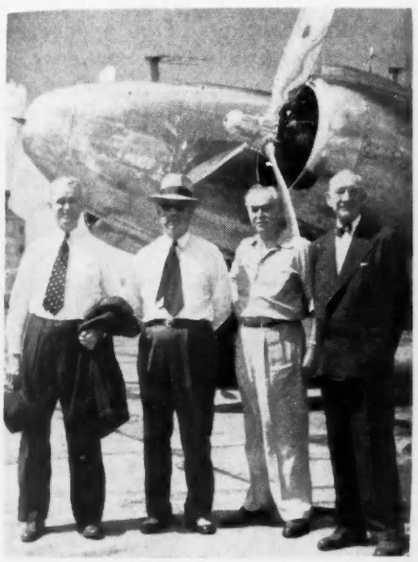
Dean Hoffman

L. V. Steffey has been transferred to the Lane-Wells division office in Oklahoma City as assistant to the division manager. Luther C. Thaxton, formerly of Oklahoma City, will take over the post vacated by Steffey, of Illinois, district superintendent at Olney.

John Petrovich is the new sales engineer for Lane-Wells at Bakersfield, Calif.

A truck station has been opened at Luling, Texas, with Lewis W. Hunt, formerly operator at Corpus Christi, now operator-in-charge of the new station.

EQUIPMENT and SERVICE SUPPLIERS' NOTES



Magcobar and Dresser Officials left Houston recently for an extensive inspection tour of Magcobar mining and manufacturing facilities. The group went to New Mexico, Colorado, Wyoming, and Canada. They are, left to right, A. J. Eastham, assistant secretary and treasurer of Magnet Cove Barium Corporation; Willard M. Johnson, president of Magcobar; J. B. O'Connor, executive vice president of Dresser Industries, and W. C. Ray, assistant to the president of Magcobar.

Rockwell Manufacturing Names Sells To Manage New Orleans Area Office

J. H. Sells

Rockwell Manufacturing Company has appointed J. H. Sells to succeed M. F. Groom as head of the New Orleans office. He will cover the New Orleans and Baton Rouge areas.

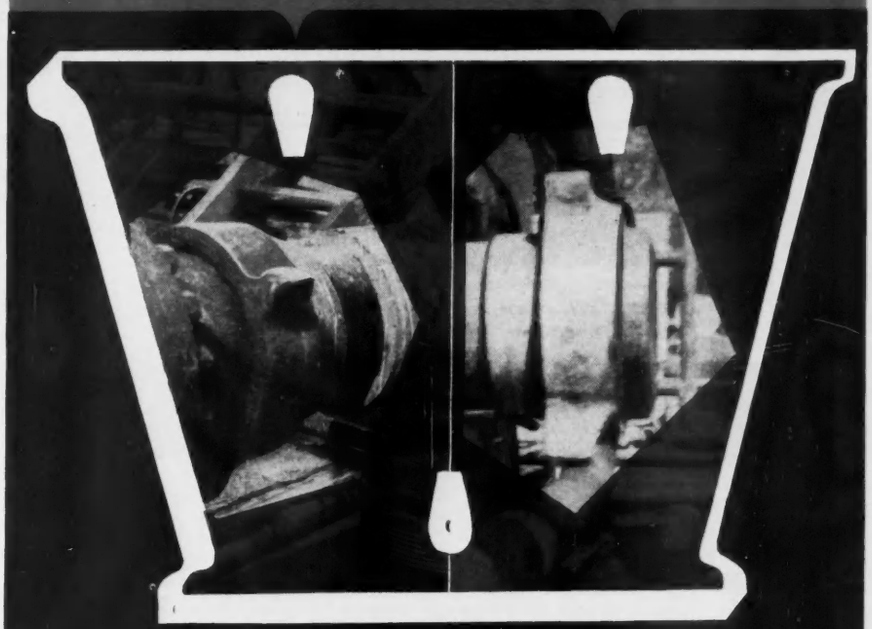
A graduate of Texas A. & M. College, Sells was with Shell Oil Company before joining Rockwell three years ago at Alexandria, La.

Seismograph Specialist Takes Post With Geophysical Consultants Firm

C. L. Fraker

C. L. Fraker, formerly seismic supervisor with Rogers-Ray, Inc., Houston, has been appointed vice president of Geophysical Consultants, Inc. of Tulsa. A graduate of Southwest Texas College, he has been engaged in seismograph exploration for over 20 years. Previous to his connection with Rogers-Ray, Inc., he was employed by Independent Exploration Company and the Amerada Petroleum Corporation, geophysical department.

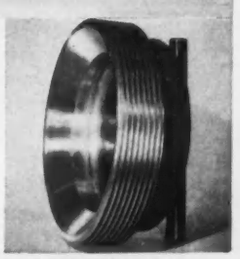
The DOUBLE DUTY
WECO Fig. 400
SUCTION UNION



Designed especially for fast, simple, time and labor saving pump suction connections, the WECO FIG. 400 UNION also provides an efficient means for compounding mud pumps, thereby eliminating the need for special line blanking equipment. The 6", 7" O.D., 8" and 10" Fig. 400 unions can be furnished with a blanking plug which replaces the female sub when necessary to compound the pumps. It can be installed in a minimum of time.

This dual service feature makes the WECO FIG. 400 your most economical suction line connection. It is a 4000 p.s.i. test steel union with rugged ACME threads, available with ends threaded or bored for welding. The blanking plug is furnished with a convenient "T" handle for easy handling.

Get "Double-Duty" from your pump suction connections by using the WECO FIG. 400 SUCTION UNION.



For "Double-duty" service with Fig. 400 suction union you need only four parts, sub-ends, wing nut and blanking plug.

WECO

WELL EQUIPMENT MFG. CORP.
Subsidiary of Chiksan Company
HOUSTON 1, TEXAS
Exclusive Sales Representative Outside Mid-Continent Area
CHIKSAN COMPANY
Brea, Calif. Chicago 3, Ill. Newark 2, N. J.
Export Sales: CHIKSAN EXPORT COMPANY, Brea, Calif. Newark 2, N. J.

Manufacturers and Distributors of Oilfield, Refining, Marine and Industrial Equipment

MASTERS
OF
MUD

Exclusive
Permian Basin
Magcobar Distributor

Every angle in mud—supply, engineering, service—is incorporated in the home - owned, independently - operated Permian Mud Service, Inc. With general offices in Odessa, Texas, and warehouses from one end of the Permian Basin to the other, we are able to quickly deliver reliable mud service to your wells. In rotary drilling work, make your mudding pay dividends. Put Permian Mud Service, Inc., on the job right away!

INDEPENDENT MUD DISTRIBUTOR AND ENGINEER

We are exclusive Magcobar distributors in the Permian Basin area, handling Jel-Oil and Jel-Oil "E" products. These special mud lubricants are among the best to improve your drilling operation in pay zones. Watch your drilling rate climb as the string goes down with these "all oil" and "oil emulsion" fluids in the mud. Analyze these facts, then act. Turn over your mudding to us—we make it a business.

WAREHOUSES EVERYWHERE IN THE PERMIAN BASIN

Big Lake, Big Spring, Bronte, Brownfield, Crane, Fort Stockton, Kermit, McCamey, Midland, Monahans, Odessa, Post, Rankin, Robert Lee, Seagraves, Snyder, Texas. Eunice, Hobbs, Roswell, and Tatum, New Mexico.

REACH THE HEART OF YOUR WELL WITH JEL-OIL AND JEL-OIL "E"

Jel-Oil is the Magcobar "all oil" mud fluid that makes pay zones pay off. Jel-Oil "E", the emulsion drilling mud, is a super-lubricant, broken into hundreds of millions of globules per cubic centimeter. Jel-Oil "E" speeds drilling, overcomes troublesome formations, and prevents hole trouble. It retards balling up when drilling sticky shale. Jel-Oil "E" forms an oil wall that is practically impervious to water passage. The small cost of the emulsion is more than offset by the savings in drilling time. Contact Permian Mud Services, Inc., exclusive distributor for Magcobar complete drilling mud service in the Permian Basin.

Permian

MUD SERVICE, INC.

1005 W. Murphy Phone 7-2356
Odessa, Texas

EQUIPMENT and SERVICE SUPPLIERS' NOTES

Southern Geophysical Firm Announces Three Major Executive Promotions

Southern Geophysical Company has promoted R. H. Dana from vice president to executive vice president; W. D. Baird, from treasurer and supervisor to vice president; and R. E. Davis, from supervisor to assistant vice president.

W. D. Baird

R. H. Dana

R. E. Davis

Dana replaces A. E. McKay, resigned. Dana, a graduate of the University of Wisconsin, worked for Stanolind Oil and Gas Company before joining Southern Geophysical in 1945.

Baird has been with the company since 1947, and previously was with Geophysical Service, Inc.

Davis, who will be in charge of the Permian Basin office in Midland, was with Stanolind before joining Southern in 1945.

Byron Jackson Company Purchases Dempsey Oil Well Pump Business

Byron Jackson Company has purchased Dempsey Pump Company, Tulsa manufacturer of an oil well pump which does not require the use of sucker rods. Operations will continue at the Dempsey plant in Tulsa, under the direction of V. C. (Bud) Horner, who has transferred from Houston. There will be no other changes in personnel.

V. C. Horner

The Dempsey pump is a combination of the usually oil well pump and a subsurface hydraulically actuated driving mechanism. Power is supplied by a small high pressure pump on the surface which forces oil through one string of tubing to the driving mechanism.

Green Resigns from Well Surveys

William G. Green has resigned as president and director of Well Surveys, Incorporated, to devote his entire time to other business interests. Charles E. Duller, vice president, has been elected a director of the company and will direct operations of the firm.

EQUIPMENT and SERVICE SUPPLIERS' NOTES

National Tube Establishes Laboratory For Metallurgical Research Work

To improve its products and assist customers confronted with unusual problems, National Tube Company has opened a new laboratory at 327 Craft Avenue in Pittsburgh. The three-story and basement building will be used for materials testing and research into metallurgical problems.

The third floor is devoted to electronic measuring devices, a photoelastic stress analysis laboratory, microscopes, oscillographs, and an engineering drafting department.

On the second floor are executive offices, conference room, library, an extensive creep-test laboratory, and equipment for hardness and other testing of steel products.

Machine shop, chemistry laboratory and fatigue testing machines are on the first floor, while most of the heavy equipment for testing full-size products is in the basement laboratory.

Allan Edwards Adds Two Engineers To Pipe Line Specialties Staff

Dave Moss

J. D. Irons

J. D. (Jeff) Irons and Dave Moss have joined the engineering staff of Allan Edwards, Inc., Tulsa manufacturer of pipe line specialties.

Irons, a Tulsa University graduate, joined Edwards as chief engineer in 1948, and later became chief engineer for Peerless Manufacturing Company, also as chief engineer. He developed the Peerless Hi-Surface Horizontal Separator and holds patents in the natural gas dehydrating field.

Moss is a matallurgical engineering graduate of Michigan College of Mining and Technology, and before joining Edwards was contact matallurgical engineer in the Mid-Continent for Jos. T. Ryerson & Son, Inc.

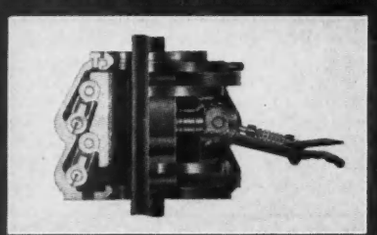
Collins Joins Iverson Supply Firm As Vice President-General Manger

T. D. (Hi) Collins has joined Iverson Supply Company, Tulsa, as vice president and general manager. Collins was formerly vice president of the Ideco Supply Store division and a member of the board of directors. Before joining Ideco, he was with The Continental Supply Company, in charge of the West Texas, North Texas, and New Mexico division.

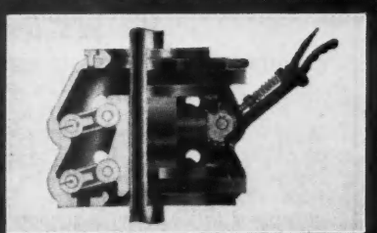
T. D. Collins

Increase Your Production Time
with the
KINZBACH
automatic tubing spider

ONE-MAN OPERATION
FAST, SAFE, POSITIVE GRIP
FULL RANGE
AUTOMATIC ALIGNMENT.



Running in. Slip segments are fully retracted



Slip Set. Note that slip segments are still parallel with the centerline of the pipe. Handle is locked in "closed" position.

This revolutionary development in Tubing Spiders, utilizes parallel-linkages to control the slip segments—a design which makes pipe handling faster and safer than ever before. The segments move at all times perfectly parallel with the tubing. The parallel slips provide a stronger grip than the conventional wedge design and will not gouge or score the tubing.

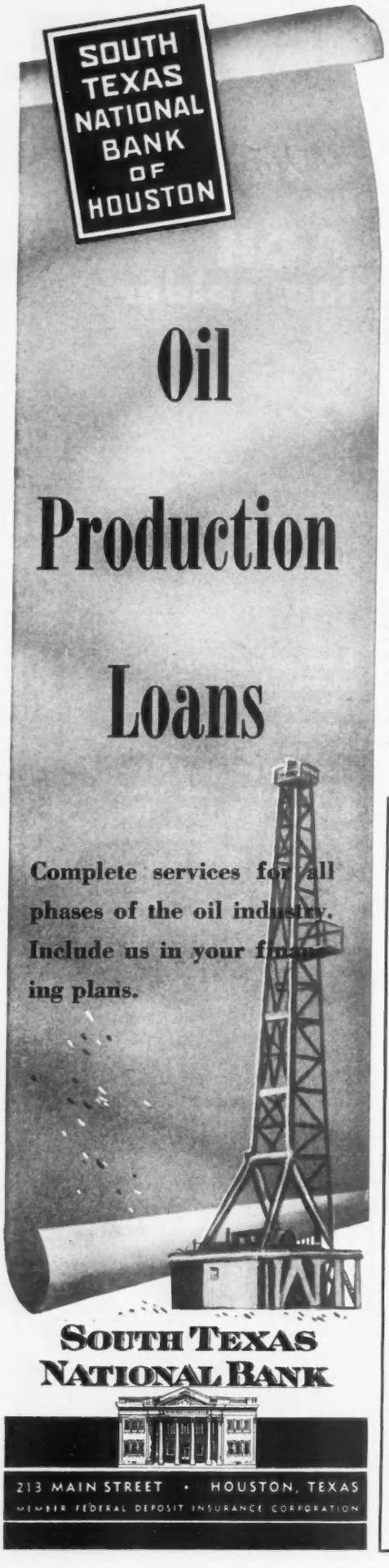
A single lever actuates the slips and they may be locked in either "open" or "closed" position. All segments are held in alignment with the tubing at all times and true radial closure is obtained.

The assembly is hinged and may be placed around the tubing without breaking a joint and may be used on well-head fittings or set in the rotary bushing.

For complete information write for Bulletin 23151.

KINZBACH TOOL CO INC

KINZBACH TOOL CO., INC.
P. O. Box 277 Houston 1, Texas
Export Office: 74 Trinity Place, New York, N. Y.


SOUTH TEXAS NATIONAL BANK OF HOUSTON
Oil
Production
Loans
Complete services for all phases of the oil industry. Include us in your financing plans.
SOUTH TEXAS NATIONAL BANK
213 MAIN STREET • HOUSTON, TEXAS
MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

EQUIPMENT and SERVICE SUPPLIERS' NOTES

New officers of Halliburton Oil Well Cementing Company are R. G. Kelly, left, and G. D. McEnroe. Kelly is vice president for the central region, and McEnroe is assistant treasurer.

Halliburton Oil Well Cementing Elects Kelly and McEnroe as New Officers

Halliburton Oil Well Cementing Company has elected R. G. Kelly regional vice president, and G. D. McEnroe assistant treasurer.

Kelly joined Halliburton in May, 1930, at Odessa, Texas, and has served at Hobbs, N.M.; as North Louisiana division manager at Shreveport; West Texas-New Mexico division manager at Midland, Texas; and at Duncan, Okla., as regional manager for the central region. He will continue to supervise the California, West Texas-New Mexico, Central Texas, Dallas and North Louisiana divisions.

McEnroe started with the company in January, 1940, as a tax accountant. Before his recent election he was tax department supervisor.

Mid-Continent Promotes Two

Glenn A. Dow, sales engineer for Mid-Continent Supply Company, Tulsa, has been promoted to division machinery manager there. Roy H. Langford, 18-year veteran in the oil business, has been named sales engineer at Tulsa.

Borger Store Manager Named

Clarence E. Craft has been named manager of Oil Well Supply Company's branch store at Borger, Texas. He has been district material supervisor in Harvey, La., for the past two years, and has been with the company since 1936.

Prompt Attention Given to Foreign Orders

"THE LUSTROUS SEVEN STAR BEAUTY"

World's Best Map Filing Cabinet

CONVENIENT • INSTANT REFERENCE • SPACE SAVER • INSTANT FILING
DUST PROOF • RUST PROOF • MEDDLER PROOF

Ultra Attractive fits the furniture scheme of any office.
Instant Adjustment—for maps or tracings from 12" to 54" long. Each Well 2" x 2", equipped with individual wood slide with holes on 2" centers, through which one screw when matched to hole in adjustment block and tightened, automatically gives perfect alignment at top for all length maps.
Substantial lock—Individually keyed.
Exterior of cabinet made of 3/4" five ply beautiful grained hardwood mitered locked joints, banded edges on door and top. Interior partitions 3/8" thick, and 1/4" slides, all three ply veneer of southern hardwood or fir.

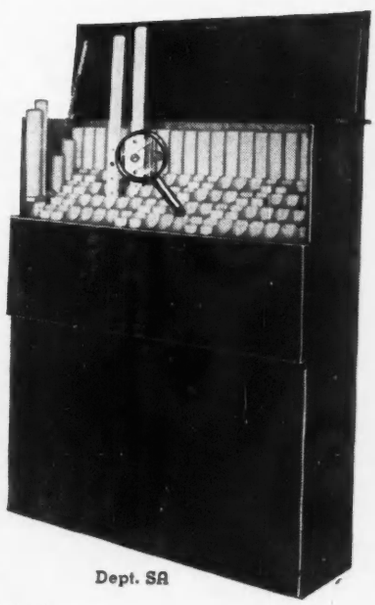
OVERALL DIMENSIONS—AND PRICES

Capacity	Width	Height	Depth	Price
60 "	29 3/8"	57"	13 3/4"	$107.25
75 "	36 3/8"	57"	13 3/4"	123.75
100 "	47 7/8"	57"	13 3/4"	140.25
160 "	47 7/8"	57"	20 1/4"	183.75
200 "	59 1/2"	57"	20 1/4"	217.25

All prices are F.O.B. Houston, Texas.
Delivery: From ten to thirty days.

Finished: Walnut, Oak, Mahogany, Olive Drab Green, Natural or Blond. Other type cabinets designed to suit your needs. Information on request.

We specialize in Drafting Boards, Light Tables and other types of cabinets, made to your specifications.



Dept. SA

PORT CITY CABINET WORKS

609-13 Quitman St. HOUSTON 9, TEXAS Phone PR-0725

EQUIPMENT and SERVICE SUPPLIERS' NOTES

Core Laboratories Announces Seven Personnel Promotions in Four Areas

Core Laboratories, Inc., has promoted seven men to positions in its West Texas, Oklahoma, Rocky Mountain and California districts.

L. V. Thomas

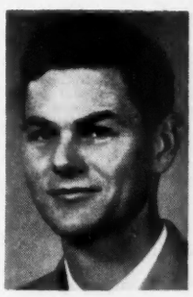
L. Vincent Thomas, formerly district supervisor in North Texas and Oklahoma, has been advanced to sales engineer with offices in Fort Worth.

John I. Caldwell, Midland, is now representing the firm as sales engineer for the West Texas area. V. B. Ogden has been appointed district supervisor of permanent lab operations in Midland, Abilene, Post and Lubbock, Texas; and Alvis O. Byrd has been placed in charge of all Core Lab formation logging operations in the Permian Basin.

R. C. Wilshusen has been promoted to district supervisor in Oklahoma, North Texas, Kansas and Indiana. Ralph Jenkins was advanced to district supervisor of the Rocky Mountain area, and C. D. Holden was named to the same duties in California.

Southern Geophysical Company Names Myer Equipment-Safety Supervisor

S. L. Myers



H. B. Mayo

Stanford L. Myers, who was with Stanolind Oil and Gas Company for more than nine years, has been appointed equipment and safety supervisor of Southern Geophysical Company.

Myers will have offices in Fort Worth, and is in charge of all equipment of the company, which operates in eight states. He also supervises the safety program.

Myers moved to Fort Worth from Dodge City, Kansas, where he has been the owner of a manufacturing company.

The company also announced the promotion of H. B. Mayo, former party chief, to supervisor at Fort Worth. Mayo joined the company in 1945.

Air Reduction's Sales Manager Named NPA Welding Section Chief

Dale D. Spoor, manager of the Equipment Sales department of Air Reduction Sales Company a division of Air Reduction Company, Inc., has been granted a leave of absence to serve with the National Production Authority in Washington, D. C.

Spoor received his degree in Engineering Administration from Massachusetts Institute of Technology in 1922.

TUBE-KOTE PREVENTS COSTLY REMOVAL OPERATIONS

PARAFFIN DEPOSITION *Successfully Prevented* By TUBE-KOTE

Internal Coating of Tubing, Flow Lines, and Related Equipment Pays Off In Continuous Operation

IF YOU HAVEN'T USED TUBE-KOTE . . . TRY ONE WELL
See How Effectively Tube-Kote Licks Paraffin!

Paraffin removal operations can be *costly!* . . . But they can be prevented in many cases by the application of "TK-2" SPECIAL-KOTE, a thermo-setting (baked-on) plastic coating. Major oil companies have proved the economy of using Tube-Kote to solve this problem. Complete technical service reports available on request.

TUBE-KOTE TUBE-KOTE
First Name In Corrosion Resistance

2520 HOLMES ROAD . . . P. O. BOX 8123, HOUSTON, TEXAS
WIRE, PHONE OR WRITE FOR TUBE-KOTE TECHNICAL SERVICE BULLETIN

Proved!

BY 14 YEARS USE

BY THE INDUSTRY

You're sure of leak-proof tubing couplings when you make them up with Rectorseal. The same is true about connections on your rig lines . . . mud, water, steam, diesel fuel, gas . . . your separator and tank battery lines.

For 14 years Rectorseal has been meeting the industry's need for a thread sealant that holds all petroleum solvents; that is economical, easy to apply; that won't freeze the connections; that is positively and permanently leak-proof.

Ask for RECTORSEAL AT YOUR SUPPLY STORE!
or write RECTORSEAL, Dept. G
2215 Commerce St., Houston 2, Texas

RECTORSEAL

Manufactured by
RECTOR WELL EQUIPMENT CO., INC.
Fort Worth, Texas
MAKING THE OIL INDUSTRY SAFER

SERVING THE
PERMIAN BASIN

•

POSTELLE
DRILLING CO.

ODESSA, TEXAS

•

Rotary Drilling
West Texas and
New Mexico

EQUIPMENT and SERVICE SUPPLIERS' NOTES

New Republic South Chicago Works To Make Oil Field Tubular Goods

Plans for the construction of a seamless tube mill at the South Chicago works of Republic Steel Corporation were announced. The mill will be the first facility for the production of tubular products by Republic Steel in the Chicago District. The first production is expected by April, 1952.

The mill will enable Republic to produce in excess of 150,000 tons of seamless tubular products per year. Sizes from 2⅜ inches OD up to 9⅝ inches OD will be produced.

Some of the production of the mill will go into oil country casing and tubing for oil wells 10,000 feet and deeper, and pipe for high temperature, high pressure service. These require tubing with heavy walls made from special analysis steels.

RATES: Regular Classified (undisplayed) set in this size type: 10 cents per word. If Box Number is to be used count an additional six words. Replies forwarded without charge. Situation Wanted: 5 cents per word. Display advertisements, set in suitably larger type with ruled border: $9.00 per column inch per insertion. Situation Wanted: $4.50 per column inch. **All classified ads payable in advance.** 10% Discount if 3 or more insertions are ordered at one time. **COPY DEADLINE:** 5th of month preceding date of issue. Send copy and checks to: Trading Post Section, World Oil, P. O. Box 2608, Houston, Texas.

FOR SALE

■ Well drills, spudders, rotaries, core-drills. All sizes new and used equipment. Tools, drill pipe, cable, pipe. Fishing tools rented. Everything for well drilling. Pressey & Son, Pueblo, Colorado.

TITANIUM GEMSTONES

CAN SUPPLY the sensationally beautiful synthetic Titania gemstones, the only thing on earth more brilliant and lively than the diamond; and at a small fraction the cost. Please that little lady with one of these marvelous gems. Ask for folder.

C. C. BOAK, Tonopah, Nevada

5150 acres of fine cotton and maize land for sale, located in Dawson County, Texas, about 12 miles southwest of Lamesa, and all in cultivation. The Sunray recently completed a small well on and near the northeast corner of this land. It is all leased for oil and/or gas to major oil companies or large independent oil companies, except approximately 55 acres, which is unleased. Will sell the land and ¼ royalty; or the land without any mineral interests; or ¼ royalty, either term or perpetual and either participating or non-participating. Correspondence invited, and brokers protected.

W. J. CLAY,
701 W. T. Waggoner Bldg.,
Fort Worth, Texas.

■ FOR SALE: Used oil barges, excellent for conversion to drilling and material barges. Write Commercial Petroleum & Transport Co., 344 Esperson Building, Houston 2, Texas.

HELP WANTED

■ WANTED—Branch Manager—Sales Manager and Salesman by distributor of engines and pumps in Texas. Address: Box 26W, c/o WORLD OIL, Houston, Texas.

GEOPHYSICAL FOREIGN SUPERVISOR, COMBINED GRAVITY AND MAGNETIC CREWS. Top salary. Ideal living conditions. Subsistence furnished. Transportation and expenses for family. Address: Box 24W, c/o WORLD OIL, Houston, Texas.

COMPTROLLER EXECUTIVE

Position open with large independent oil producer in Houston area — only those with extensive experience need apply. Excellent opportunity. Address: Box 25W, c/o World Oil, Houston, Texas.

OIL AND GAS

In Western North Dakota and Northwestern South Dakota, I have a well selected spread of oil and gas leases, all of them running for approximately a ten year period. Correspondence invited, and brokers protected.

W. J. CLAY,
701 W. T. Waggoner Bldg.,
Fort Worth, Texas

■ Will act as your buying agent for oil and gas leases and royalties, in the Mid-Continent and Southeastern States fields. C. W. DEMING, Oil Lands Consultant, P. O. Box 1874, Tulsa, Okla., Box 320 Waycross, Ga.

SITUATION WANTED

Drilling contractor operating in West Texas and New Mexico desires to contact small or medium-sized independent oil company who needs an operating manager. Personal interview desired. Twenty years experience in all phases of the oil industry. Address replies to Box 94-W, WORLD OIL, Houston 1, Texas.

DECALS

TRUCK LETTERING AND TRADEMARK decals made for your trucks. Easy to apply, uniform, distinctive, economical for small or large needs. Write for Catalog. Mathews Company, 827 S. Harvey, Oak Park, Ill.

NOTICES

MAPS MADE TO ORDER—Maps of any scale constructed from your maps, aerial photographs or metes and bounds. Well locations, plats, graphs, cross-sections and exhibits made to specifications. Mr. C. W. Aschbacher, 739 Kress Bldg., Houston. CH-0059.

New Books, Maps and Movies

Drilling Mud Control

A little more than five years ago the Division of Extension of the University of Texas published the first edition of a mimeographed training manual called "Principles of Drilling Mud Control." J. Ed Warren of Midland was then vice president of the American Association of Oilwell Drilling Contractors and Guy Mabee was chairman of the Permian Basin chapter. The modest cost of bringing out this first manual, which was concerned chiefly with Permian Basin mud practices, was underwritten by Warren and Mabee.

In this modest way was launched one of the outstanding industrial educational projects of recent years. This is evidenced by the announcement of the publication of the eighth edition of the manual which is familiarly known throughout the drilling industry of the world as "the mud book." The present edition brings to almost 11,000 the number of copies of the manual placed in distribution since 1946. More than 7000 men in the drilling industry have been given formal training in mud control. The course has been offered in 13 states and one Canadian province by the University of Texas, Long Beach City College, Southwest Louisiana Trade School, Oklahoma A. & M. College and the University of Alberta. In each instance the drilling contractors of the U. S. and Canada have taken the lead in sponsoring the work.

Mud engineers for the operating companies and for the mud service companies have supplied the information from which the successive editions of the manual have been prepared, according to John Woodruff, coordinator of the Petroleum Industry Training and editor of the manuals.

The eighth edition was revised under the direction of the Study Committee on Drilling Fluids of the Southwestern District of the API, whose current chairman is Jack L. Battle of Humble Oil & Refining Company. A subcommittee was appointed for the work on the manual with J. M. Bugbee of Shell Oil Company as chairman. Membership of this committee includes Battle, George E. Cannon and Roger Williams, Humble; George R. Gray and J. P. Simpson, Baroid Sales Division; W. C. Goins and W. F. Rogers, Gulf Oil Corporation; O. W. Van Dyke, B. G. Green and C. Sidow, Magnet Cove Barium Corporation; Preston Chaney, H. Denton and H. W. Perking, Sun Oil Company.

In the current edition, chapters I through VI and chapter XV, which comprise the broad, general discussions of mud conditioning and its relation to drilling problems and practices, have been rewritten by the general subcommittee. Only the Gulf Coast, Tri-State and West Texas area chapters have been rewritten. Chapter X, Mud Practices in the Prairie Provinces of Canada, is a newly written chapter. These contributions have been made by area subcommittees working under the auspices of the general subcommittee.

Divisions of Extension, University of Texas, Austin, Texas; or American Association of Oilwell Drilling Contractors, Dallas, Texas.

Water-Flooding in Illinois

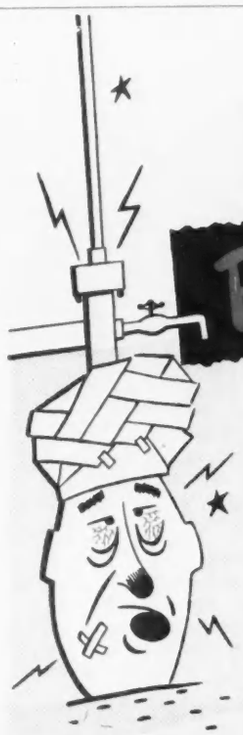
A summary of water-flooding operations in Illinois during 1950, Circular No. 165, has been prepared by Dr. Frederick Squires and members of the Secondary Recovery Study Committee for Illinois, Secondary Recovery Division, Interstate Oil Compact Commission. Included is data on 31 Illinois controlled water floods in table form, as well as a brief description of six water floods and conclusions from a comparison of the floods described.

Illinois State Geological Survey, Urbana, Ill.

Oil and Gas Directory

More than 61,000 businesses in Texas, Oklahoma, Louisiana and New Mexico are listed in the 1951 edition of "Oil and Gas Directory." Names of officials and other key personnel are included in the 400 page volume, which is indexed and cross-indexed by classification for quick reference. The listing is compiled from daily newspapers, trade publications, reports from field men, more than 400 telephone books, and thousands of personnel lists.

Oil and Gas Directory, Inc., 504 Richmond, Houston 6. $18.

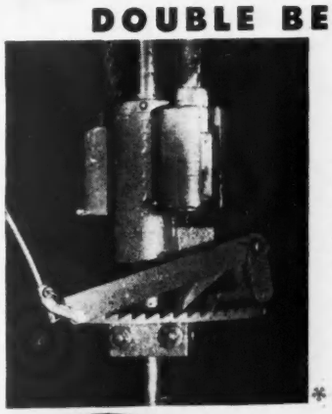


A SURE CURE for PARAFFINITIS*

There is no need to put up with this malady . . . no need to give your wells frequent and costly treatments of steaming out or pulling the rods to remove paraffin and maintain production.

Huber Paraffin Scrapers are a permanent cure for paraffin accumulation. Attached to the sucker rods, they wipe the tubing walls clean of paraffin. The scraper blades are shrink-fitted to the rods which are rotated by the Huber Rotating Rod Hanger. Wiping action takes place as the string is rotated and reciprocated.

DOUBLE BENEFIT ROTATION



The combined rotating and reciprocating motion wipes paraffin from the tubing in particles so small they go out in solution . . . can not clog tubing, scrapers, or flow lines. Rod rotation prolongs coupling life by equally distributing wear . . . prolongs pump life and efficiency by equalizing wear on working barrel. Get this added benefit while eliminating paraffin accumulation by installing Huber Scrapers and Huber Rotating Rod Hangers.

Cure your wells of paraffin accumulation . . . install Huber Paraffin Scrapers and Rotating Rod Hanger, NOW!

* Congestion caused by the accumulation of paraffin in pumping wells.

For further information see your local supply store, or write

J. M. HUBER CORPORATION,
Box 831 . . . . . Borger, Texas

HUBER

PARAFFIN SCRAPERS

SCRAPE AS THEY ROTATE AS THEY RECIPROCATE

Be Sure of a Catch Use

O'BANNON

SUCKER ROD SOCKETS

O'Bannon sockets give superior results, because they are thoroughly engineered and are made from carefully selected alloys, accurately machined to close tolerances and heat treated under closely controlled conditions so as to develop the full strength of the materials.

Type B Socket

FOR RODS AND SOFT COUPLINGS USE TYPE B SOCKETS

A combination socket with an upper set of wickered slips for rods and a lower set of wickered slips for couplings.

Overshot Socket

FOR RODS AND HARDENED COUPLINGS USE OVERSHOT SOCKETS

A combination socket with an upper set of wickered slips for rods and a tough slip unit for couplings.

When couplings are larger than those ordinarily used in the tubing, use an **Oversize Overshot Socket.**

FOR SPECIAL FISHING JOBS

To catch rods and pins only, especially pins inside pump barrels, use BABY RED SOCKETS.

To guide the break into the socket when fishing rod breaks in casing, use CASING ADAPTERS AND BELLS.

See pages 48, 49 and 50 of your O'Bannon Catalog No. 10 for detailed information on these and other O'Bannon Sockets.

Sold By Supply Stores

Walter O'Bannon Co.

Tulsa 1, Oklahoma

SQUEAKS from the BULLWHEEL

Handy Guide to Business English

A Program: Any assignment that can't be completed by one telephone call.

Channels: The trail left by interoffice memos.

Consultant: Any ordinary guy more than 50 miles from home.

Under Active Consideration: We're looking in the files for it.

Conference: A place where conversation is substituted for the dreariness of labor and the loneliness of thought.

To Negotiate: To seek a meeting of minds without a knocking together of heads.

A Clarification: To fill in the background with so many details that the foreground goes underground.

"We Are Making a Survey": We need more time to think of an answer.

Note and Initial: Let's spread the responsibility for this.

"Let's Get Together on This": I'm assuming you're as confused as I am.

"Give Us the Benefit of Your Present Thinking": We'll listen to what you have to say as long as it doesn't interfere with what we've already decided to do.

"Will Advise You in Due Course": If we figure it out, we'll let you know.

Spearhead the Issue: You be the goat.

Handicap

A ministry student named Fiddle
Refused to accept his degree.
He said: "It's enough to be Fiddle,
Without being Fiddle, D.D."

Footloose

"How are you getting on at home since your wife went away?"

"Fine! I've reached the highest point of efficiency. I can put my socks on from either end."

Note the full swiveling action!

Coup de Grace

A nine-year-old girl back from a birthday party told her mother that the boys had all huddled together and ignored the girls. "But I got one of them to pay attention to me, all right," she added.

"How?" asked her mother.

The young lady replied, "I just knocked him down."

Savings Plan

MILLION DOLLARS: A sum that may be honestly acquired by putting aside $122.55 out of one's salary every week for 80 years.

Gotkool
water cans and coolers
GOTKOOL WATER CAN
Made in 1½, 2, 3, 5, 10, 15 and 20 gallon sizes. Push-Button Faucet at slight additional cost.
KEEP PURE DRINKING WATER ALWAYS HANDY
GOTKOOL WATER COOLER
Made in 2, 3, 5, 8, 10, 15 and 20 gallon sizes with Push-Button Faucet.
GOTT Water Coolers are the convenient way to keep drinking water handy to the worker, protect it from impurities. Their exclusive construction keeps water cool for long periods. Snug-fitting, large, removable top, handy non-leaking push-button faucet. GOTT Water Cans for handy field use. Your supply store has them, get one today!
STANDARD OF THE OIL FIELDS
Insist on the Genuine
H. P. GOTT MFG. CO.
WINFIELD, KANSAS

What's NEW

In Perforating, Testing, and Fishing Tool Services

McCULLOUGH®
NEW SERVICES • NEW TOOLS
NEW WAYS OF DOING THINGS

Latest News About New Tools, Techniques and Services

SAVE TIME, MONEY and PIPE

With McCullough Jet Back-Off Tool or String Shot Service and the One and Only Magna-Tector!

Pipe is scarce and rig time is costly. What could be more economical than backing-off the pipe, recovering all free pipe above the stuck point in one piece, and getting it done in a fraction of the time?

Yet there are limitations in the use of only ONE back-off tool in attempting to free stuck drill pipe, drill collars, subs, casing, tubing and wash pipe. NO ONE TOOL can accomplish EVERY back-off job. But there are TWO back-off tools and between the two, EVERY TYPE of back-off job CAN be accomplished!

That is why McCullough crews arrive at your well with both the McCullough Jet Back-Off Tool and String Shot. These tools plus the McCullough Magna-Tector, that quickly and accurately locates the stuck point, represent an extremely versatile combination service designed to save you time, money and pipe.

These are NOT mechanical tools or fishing tools. They are progressive tools, electronically controlled for accuracy and speed. They are responsible for the sharp decline in fishing in recent years, permitting wells to be drilled faster—saving oil operators thousands of dollars!

HOW YOU SAVE TIME, MONEY AND PIPE

1. TIME SAVER
   a. Accuracy of the McCullough Magna-Tector in locating the stuck point consistently, eliminates unnecessary back-off shots.
   b. New, high-temperature, high-pressure resistant detonators in the back-off tools eliminate mis-runs.
   c. These electric wire line tools are run into and out of the well in a fraction of the time required with mechanical cutters.
   d. In addition they are electronically controlled permitting greater speed and accuracy than ordinary electric wire line tools.
   e. Electronics also provides MORE information about conditions in the well—locating collars, tight places, fluid level, etc., both audibly and visibly.

2. MONEY SAVER
   a. McCullough Back-Off Service accomplishes ANY TYPE of back-off job, leaving the fish in good condition for subsequent operations.
   b. The use and need of a rotary table is eliminated.
   c. McCullough Magna-Tector, many times, indicates that working and spotting oil will free the pipe, eliminating the need of backing-off and fishing.
   d. Guesswork is eliminated.

3. PIPE SAVER
   a. Eliminates cutting and damage to the pipe.
   b. Permits recovery of all free pipe in one piece and the freeing and recovery of all stuck pipe in undamaged sections.

WHAT TO DO

When your pipe becomes stuck—CALL McCullough IMMEDIATELY! The McCullough Magna-Tector will quickly locate the lowest free point, the stuck point and do it accurately. Then the McCullough Back-Off Service will free all loose pipe in one piece—simplifying the fishing job.

Since time is important McCullough Back-Off Service is fast. All free pipe will be removed BEFORE it can stick further up the hole.

No two stuck pipe conditions are exactly alike. This is another reason why you NEED McCullough VERSATILE Back-Off Service. The complete equipment, the skill of experienced McCullough crews, and the special techniques they have devised WILL SAVE YOU TIME, MONEY AND PIPE!

Call McCULLOUGH!

WRITE FOR THIS CATALOG

Pages 3228 to 3231 in the McCullough section of the Composite Catalog describes these tools individually and in detail—with illustrations, specifications and operating data. Write for your free copy today.

PERFORATING, TESTING AND FISHING SERVICE ANYWHERE — ANYTIME!

McCULLOUGH TOOL COMPANY
5820 South Alameda Street, Los Angeles 58, California
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CANADA: Edmonton, Alberta • **EXPORT OFFICE:** Los Angeles, California
VENEZUELA: United Oilwell Service Co., S.A.; Caracas, Anaco, Maracaibo

SERVICE LOCATIONS: **TEXAS:** Houston, Snyder, Alice, Cisco, Corpus Christi, McAllen, Odessa, Tyler, San Angelo, Victoria, Wichita Falls. **OKLAHOMA:** Oklahoma City, Guymon, Healdton. **MISSISSIPPI:** Laurel. **NEW MEXICO:** Hobbs. **KANSAS:** Great Bend. **WYOMING:** Casper: **CALIFORNIA:** Los Angeles, Avenal, Bakersfield, Ventura. **LOUISIANA:** Houma, Lake Charles, New Iberia, Shreveport. **COLORADO:** Sterling.

Mid-Continent NEWS and HUMOR?

VACATIONS' OVER . . .

. . . and though our folks, like those of other companies, wandered through the mountains and frequented the beaches, our famous "Around-the-Clock" service to the oil industry never faltered.

So, now, vacation time, or anytime, if you need a Nipple, a Bull Plug, or a Mid-Continent Rig Drive, follow the road to the store with the blue neon oil-spouting derrick on top—it's your sign of sure supply!

Mid-Continent NEWS Original Cartoon

MID-CONTINENT Supply Company

General Offices Mid-Continent Bldg. FORT WORTH, TEXAS

SQUEAKS FROM THE BULLWHEEL

Just Cause

Judge: What induced you to strike your wife?

Defendant: Well, your honor, she had her back to me, the broom was handy and the back door was open, so I thought I'd take a chance.

Changing the Subject

Wife: I've got a lot of things I want to talk to you about.

Husband: That's good. Usually you want to talk to me about a lot of things you haven't got.

By Request

Customer: Remember that cheese you sold me yesterday?

Grocer: Yes, madam.

Customer: Did you say it was imported or deported from Switzerland?

Still Kicking

The kids' party had been a huge success—only minor altercations, almost negligible bruises, and everyone had won a prize. Came refreshment time, and the mother of the small hostess carried in the cake, which was accompanied by a shining mold of shimmering, quivering gelatin. Most of the young guests squealed their delight and anticipation, but little Charlie took one look and announced firmly:

"None of that red stuff for me! It ain't even dead yet!"

Fizzle

Platonic love is like being invited down to the cellar for a bottle of ginger ale.

Analysis

Child specialist to mother of small boy: "You'll have to handle this child carefully. Remember, you're dealing with a sensitive, high-strung, little stinker.

"Scorcher today, eh wot?"

Depreciation

He was having trouble cutting his two-dollar steak and finally called the waiter. "I can't cut this stuff. Take it back and bring me another."

The waiter bent low and inspected the meat. "Sorry, I can't take it back. You've bent it."

Bet's On

"What on earth are you going to do with that nag?" asked the farmer.

"Oh," replied the cocky young sportsman, "I'm going to race him."

The farmer took a second look at the animal. "Well, you'll win," he said.

Preventive

"Buck up, old man! Why don't you drown your sorrow?"

"Can't. She's stronger than I am."

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for DRILLING COMPLETION PRODUCTION

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FULL OPENING

TYPE YH CASING HEAD — 4000 LBS. TEST. A versatile head that meets most combination drilling and production requirements. 100% full opening.

Any well that needs a casing head is a more profitable producer when equipped with a Hinderliter *"Better Built"* Head.

The complete range of sizes and types permits the selection of a head designed for your particular situation. No specially trained operators or equipment are needed to install them.

For almost 30 years Hinderliter has provided the most "usable" heads in the industry. Make your next one a Hinderliter, and your jobs of Drilling, Completion and Production will be easier and safer.

Write for Bulletin

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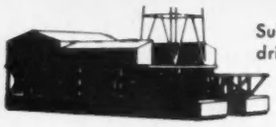
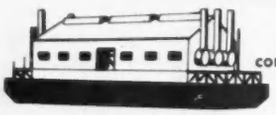
BUILDS FINE SPECIALIZED MARINE EQUIPMENT FOR THE PETROLEUM INDUSTRY



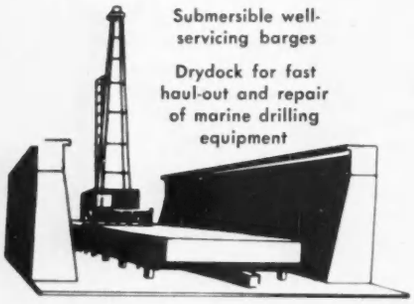
Submersible drill barges

Tugs



Boiler and compressor barges

Water, oil, and supply barges



Submersible well-servicing barges

Drydock for fast haul-out and repair of marine drilling equipment

Levingston is not only located conveniently with respect to marine drilling operations on the Gulf Coast, but here you will find marine engineers and constructors who understand the language of oil operators. Bring your marine petroleum equipment problems to Levingston *first* for a quick economical solution.

Levingston

SHIPBUILDING CO.

Orange, Texas

SQUEAKS FROM THE BULLWHEEL

Modest Taste

The man was frantically looking for a place to live. Meeting an out doorsy, sportsman friend, he asked him if he knew where he could find a house.

"House?" the naturalist inquired with disdain. "Boy, you're getting soft. Why don't you live out in the open air; let old Mother Nature cover you with a blanket of stars, and have the blue firmament above as a roof?"

"Frankly," said the man, "I had in mind something a bit smaller."

Success Formula

Early to bed,
Early to rise,
Till you make enough cash
To do otherwise.

The Tie That Binds

"My wife came from a very large family. Did yours?"

"No, she brought it with her."

It's a Long Way to Heaven

In a small West Texas town there were two churches across the street from each other.

"Couldn't those churches be combined?" a visitor asked.

"Not very well," was the reply. "That church over there says, 'There ain't no hell,' and this one says, 'The hell there ain't.'"

"I decided to heck with the usual crumby doghouse!"

Theory vs. Practice

"Well," said the candidate, "how did you like my speech on the agricultural problem?"

"It wasn't bad," agreed the farmer, "but a day's rain would do a heap more good."

For Complete Protection, Use

HERCULES

TUBING HANGERS

Because of the protection provided, no well should be "put on the pump" without installing a Hercules Tubing Hanger for suspending the tubing. All Hercules Tubing Hangers use the well known Hercules overhead packing arrangement. Made in all sizes to support up to 4" tubing. There is also available a Hercules type RH Hanger with means for packing off around both cable and tubing when used with Reda bottom hole pumps. To assure complete tubing protection, be sure to specify Hercules Tubing Hangers. Write for Bulletin.

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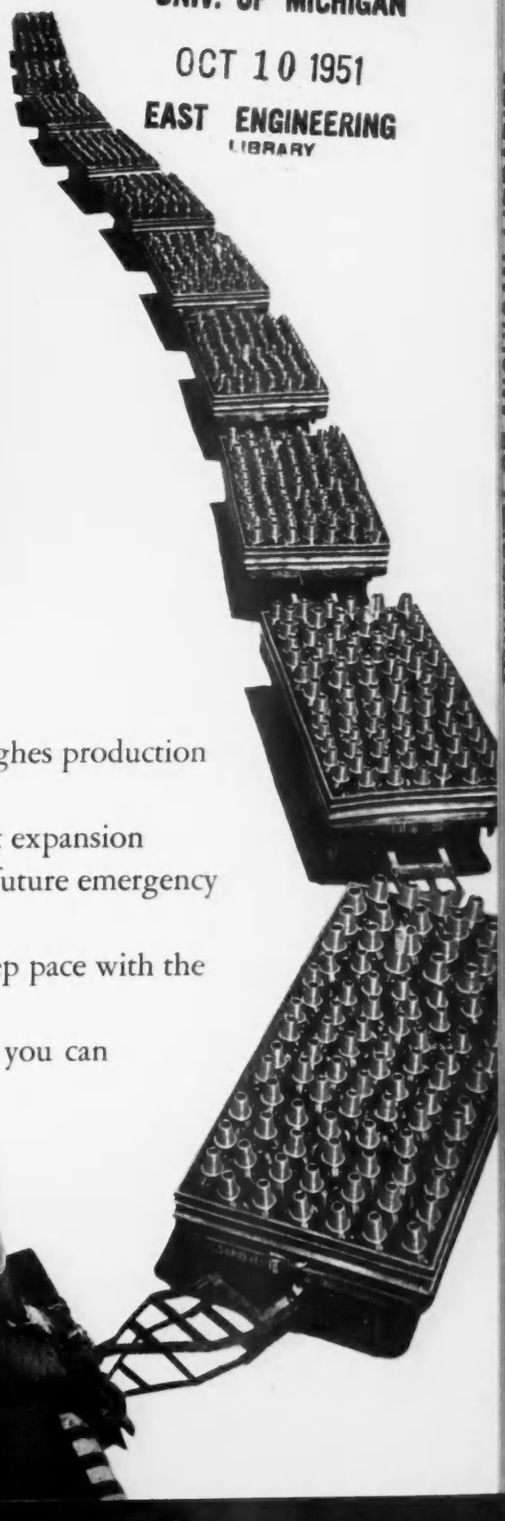

Hughes Bit Production *doubled*

More than twice as many rock bits are now coming off the Hughes production line as were being produced at the close of World War II.

This high rate of production has been made possible by a plant expansion program started in 1946 to place our company in position to meet future emergency bit requirements of the industry.

As a result of this foresightedness, Hughes has been able to keep pace with the unprecedented and unforeseen bit demands of the past two years.

Here, again, is proof of the fact that you can depend upon Hughes to anticipate your rock bit requirements.

HUGHES
TRI-CONE
ROCK BITS

Rigging Up!

● "Rigging up" is a familiar sight in the oil fields...it means they're getting all the necessary equipment and materials in place to begin operations—drilling the well.

"Rigging up" or building a cement plant means about the same thing... getting ready to begin operations—making cement.

But, unlike the drilling rig, which is torn down and moved when the well is completed, this modern, well-equipped cement plant, located at an excellent deposit of high-grade raw materials, will be there for many years to come—turning out high quality products to meet the ever-advancing needs of the Oil Industry.

Photo, below, taken several months ago, shows rapid construction progress at new Lone Star Cement plant, at Maryneal (near Sweetwater) in West Texas—third Lone Star mill in the Lone Star State.

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